



Science-Switzerland, December 2025 – January 2026

News on Swiss science, technology, education and innovation



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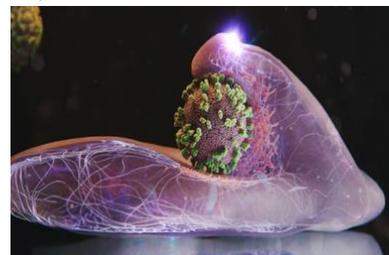
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How Influenza Viruses Enter our Cells

Cells are not mere victims of influenza; they actively engage the virus, using mechanisms meant for absorbing essential nutrients to incorporate it. Researchers, led by Prof. Yohei Yamauchi at ETH Zurich and collaborators at Kanazawa University and Nagoya University, have shown that cells enhance virus uptake, reshaping our understanding of viral infections. This could change how we fight influenza and other viruses. The team used a new microscopy method, combining atomic force and fluorescence microscopy (ViViD-AFM), to watch virus entry into cells in real-time. This technique reveals how cells assist virus infection and tests drug efficacy directly in cell cultures. The method offers a detailed look at virus-cell interactions, potentially advancing our approach to combating infectious diseases.

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(ETH Zurich, December 05, 2025)



Graphene Membranes Show Promise for Cheaper CO2 Capture

Researchers at EPFL, led by Dr. Marina Micari and Associate Professor Kumar Varoon Agrawal, have developed a pyridinic-graphene membrane that captures CO₂ more effectively and economically than existing methods. This advancement proves especially beneficial for reducing emissions from cement production, offering a viable way for industries to lower their carbon emissions. The team applied experimental data and modeling to mimic actual plant conditions, evaluating the energy and cost benefits of using these membranes on a commercial scale. Through testing various graphene-based membranes, they found the pyridinic-graphene variant outperformed others in efficiency and durability. This innovation could revolutionize CO₂ capture, positioning pyridinic-graphene membranes as a new benchmark in carbon capture technology.

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(EPFL, December 15, 2025)

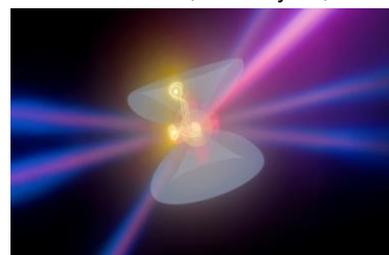


X-Ray Breakthrough Unlocks Electron Secrets

Researchers from the Paul Scherrer Institute, EPFL, Max Planck Institute of Nuclear Physics in Germany, and the University of Bern, led by Dr. Ana Sofia Morillo-Candas and Dr. Gregor Knopp, have developed a new technique called X-ray four-wave mixing. This method reveals how electrons interact with each other and their environment, offering new insights into quantum information storage and loss. This breakthrough, once deemed nearly impossible, is crucial for advancing quantum computing and technologies. The team used sophisticated X-ray light manipulation, splitting, delaying, and recombining beams with the help of X-ray free-electron laser facilities like SwissFEL. They demonstrated this technique on neon gas using an aluminum plate with four small holes, inspired by traditional laser experiments. This achievement could enable new research in material science, energy storage, and the creation of next-generation quantum devices, thanks to our improved ability to observe and control electron interactions.

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(Paul Scherrer Institute, January 19, 2026)





1. Policy

Trust in Prestige Journals Challenged

The most unexpected findings often emerge from the most respected journals like Nature, Science, and Cell. Prof. Bruno Lemaitre's team at EPFL, through the ReproSci project, showed that over 80% of drosophila immunity research claims from 1959 to 2011 were reliable, questioning the widespread concern over reproducibility. Yet, this study also found a higher rate of non-reproducible results in these prestigious outlets, shaking the traditional faith in their credibility. The ReproSci team meticulously reviewed 400 papers, pinpointing over 1,000 claims and directly retesting 45 crucial ones without prior follow-up studies. This thorough investigation proves that despite occasional non-reproducible findings, most research in this domain stands solid. EPFL's work not only highlights the enduring reliability of scientific claims over time but also emphasizes the need to critically evaluate studies, regardless of the journal's fame. Lemaitre's method introduces a fresh perspective on the challenges and intricacies of ensuring research reproducibility.

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(EPFL, December 11, 2025)



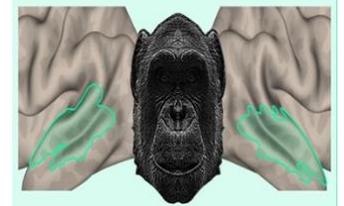
3. Life Science

Our Brains Recognize the Voices of our Primate Cousins

Researchers at the Université de Genève (UNIGE) led by Dr. Leonardo Ceravolo have found that our brains are finely tuned to recognize the voices of our closest primate relatives, chimpanzees. This discovery challenges our understanding of voice recognition and its role in the evolution of language, demonstrating that certain areas of the human auditory cortex are particularly responsive to chimpanzee vocalizations. The study highlights a shared vocal processing skill between humans and great apes, suggesting a deep evolutionary link. The team tested 23 participants with vocalizations from humans, chimpanzees, bonobos, and macaques. Using functional magnetic resonance imaging (fMRI), they discovered a specific subregion in the auditory cortex that reacts to primate voices. This breakthrough sheds light on the evolution of communication, showing that our brains may have preserved a sensitivity to the sounds of our primate cousins.

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(University of Geneva, December 03, 2025)

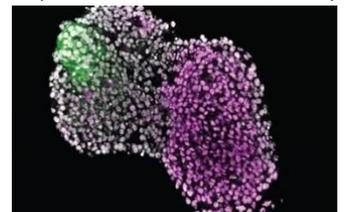


Stem Cell Organoids Mimic Aspects of Early Limb Development

Researchers have developed so-called "budoids," 3D organoid models that replicate early limb development, offering an ethical alternative to animal testing. This innovation, led by Prof. Can Aztekin, highlights the role of the apical ectodermal ridge (AER) in tissue formation and cell identity without using animals. It opens new paths for studying congenital disorders, evaluating harmful substances, and investigating regeneration methods. The team used mouse embryonic stem cells to create budoids that mirror the critical aspects of embryonic limb tissues. This process demonstrates how AER-like cells direct tissue organization and impact limb development. Budoids facilitate high-throughput studies and reduce reliance on animal models, providing key insights into limb formation and disorders.

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(EPFL, December 03, 2025)



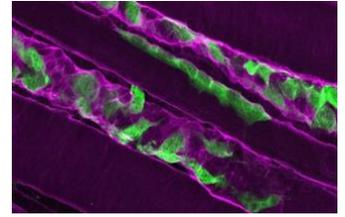


Key Protein Identified in Congenital Muscle Weakness

(University of Basel, December 03, 2025)

Researchers from the University of Basel and Jagiellonian University, led by Dr. Timothy McGowan and Prof. Markus Rüegg, have identified a critical role of the protein laminin- $\alpha 2$ in muscle repair. This protein, produced by muscle stem cells, is essential for generating new muscle fibers and supporting cell proliferation. Without it, muscle stem cells grow more slowly, impairing muscle repair after injury. This finding points to laminin- $\alpha 2$'s significant impact on muscle degeneration in LAMA2-related muscular dystrophy, a condition that affects about eight in every million children and often leads to early death. The team conducted experiments on mice lacking laminin- $\alpha 2$ and human muscle stem cells, demonstrating laminin- $\alpha 2$'s vital role in muscle cell proliferation and regeneration.

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Protein Engineering with Unnatural Amino Acids

(ETH Zurich, December 11, 2025)

Researchers at ETH Zurich, led by Tarun Iype and Dr. Maximilian Fottner, have developed a method to introduce unnatural amino acids into bacteria, overcoming a major hurdle in biotech production. Their innovation enables the creation of designer proteins with unmatched efficiency and effectiveness, potentially transforming therapeutic development and catalytic processes. The team modified a bacterial transport system to introduce unnatural amino acids into cells. By enclosing these amino acids in short, synthetic peptides and making precise adjustments to the transport system's shuttle component, they were able to tailor the binding site for these peptides.

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Gut Bacteria and Multiple Sclerosis Progression

(University of Basel, December 17, 2025)

Certain gut bacteria can trick the immune system into attacking the body's nerves, speeding up the progression of multiple sclerosis (MS). This dangerous connection between our microbiome and immune system was uncovered by a team led by Dr. Lena Siewert and Dr. Kristina Berve from the University of Basel and University Hospital Bonn. They found that gut bacteria with structures like the myelin sheath can speed up MS through 'molecular mimicry,' revealing how the immune system's failure to distinguish harmful bacteria from the body's tissues can lead to severe diseases. The researchers modified Salmonella bacteria to mimic the myelin sheath and studied MS progression in genetically modified mice.

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Preventing Protein Processing Errors to Fight Cancer

(ETH Zurich, January 05, 2026)

Researchers from ETH Zurich, the University of Konstanz, and Caltech, led by Dr. Denis Yudin and Dr. Nenad Ban, have discovered a new function of the 'NAC' protein complex in modifying histones H4 and H2A during their synthesis. This process is crucial for maintaining chromosome integrity and suggests new cancer treatment strategies. The team showed that the NAC (nascent polypeptide-associated complex) directs specific enzymes to the ribosome, ensuring the correct modification of histone proteins.

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The Role of Microtubules in Cellular Signal Processing

(Paul Scherrer Institute, January 05, 2026)

Researchers at the Paul Scherrer Institute, led by Dr. Sung Ryul Choi and Dr. Michel Steinmetz, have revealed a new role for microtubules in signal transmission. They showed that the protein GEFH1 binds to microtubules at the C1 domain, activating the RhoA signaling pathway, crucial for cellular processes. This finding enhances our understanding of cell mechanics and suggests new strategies for medical treatments by targeting these molecular interactions. The team used cryo-electron microscopy, biochemical, and cell biological methods to demonstrate this interaction. They engineered GEFH1 fragments that attach to microtubules, created variants with altered docking sites, and integrated these into cells to study the binding specifics.

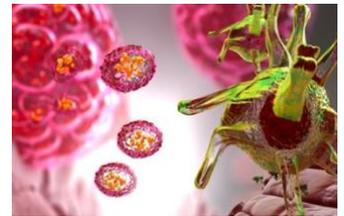


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Engineering Immune Cells to Fight Cancer from Within

(EPFL, January 05, 2026)

Researchers from EPFL, the University of Lausanne, and their partners have developed a new method to boost the immune system's fight against cancer by enhancing dendritic cells, the immune system's scouts. Dr. Michele De Palma, Dr. Ali Ghasemi, and Dr. Yahya Mohammadzadeh led the team in creating a technique that improves the capacity of dendritic cells to detect and attack cancer cells. This innovation marks a major advance in cancer immunotherapy, and offers hope for treating resistant melanomas and possibly other cancers by revitalizing dendritic-cell-based treatments. The team bioengineered dendritic cell progenitors with a special receptor to better consume and present cancer markers to the immune system, coupled with an instructive chimeric antigen receptor (iCAR) for enhanced T cell activation.

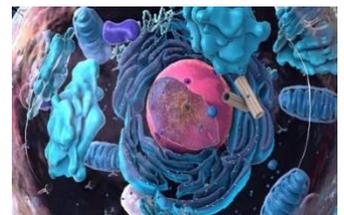


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How Cells Balance their Protein Levels

(EPFL, January 05, 2026)

Cells balance their own protein levels automatically, showing a built-in resilience that's particularly strong in embryonic stem cells. Researchers at EPFL, led by Prof. David Suter, found that mammalian cells automatically match their protein disposal rates to changes in production. They call this built-in mechanism Passive Adaptation, which provides an extra layer of protection in mouse embryonic stem cells. The team used a color-shifting fluorescent protein to track how individual cells produce and break down proteins. Combined with a mathematical model, this approach accurately predicts how protein dynamics change over time.



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Enzyme Key to Halting Prostate Cancer Discovered

(EPFL, January 08, 2026)

A team led by Dr. Wouter Karthaus and Dr. Eneda Toska, from a consortium including EPFL and The Johns Hopkins University, found that the enzyme named 'KMT2D' is a vital epigenetic regulator in prostate cancer. It boosts androgen receptor activity in certain cancers and maintains a stem cell-like subtype in more aggressive, treatment-resistant forms. The researchers used genetically engineered prostate cancer cell lines, patient-derived organoids, single-cell sequencing, and animal models in their study. Silencing or removing KMT2D altered cancer cell behavior and increased treatment sensitivity.



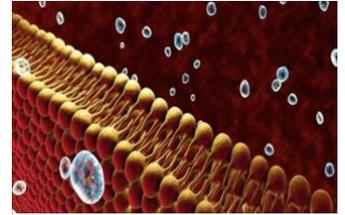
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Each Lipid Has Its Own Dedicated Protein Transporters

(University of Geneva, January 12, 2026)

Researchers uncovered the precise nature of protein-lipid transport within cells, debunking the old idea that proteins simply act as universal carriers for lipids. The team, led by Professor Anne-Claude Gavin from the University of Geneva, European Molecular Biology Laboratory (EMBL), and the University of Bergen (UiB), found that specific lipids pair with a select few proteins for their journey within the cell. This insight changes our understanding of various diseases related to lipid metabolism. Using dual experimental methods, one in a test tube and another simulating cellular conditions, the researchers pinpointed unique lipid-protein pairs. This dual approach revealed lipid transport mechanisms more clearly than ever before.

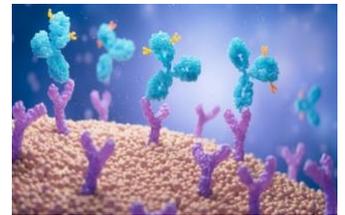


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Why the Same Medicine Works for Some Patients but Not Others

(University of Basel, January 12, 2026)

Researchers at the University of Basel, led by Dr. Rosalba Lepore, Professor Lukas Jeker, and Dr. Romina Matter-Marone, have found that genetic differences can make some antibody-based therapies ineffective. They showed that variations in a single amino acid could prevent antibodies from working in certain individuals. This insight is crucial for creating personalized medicine, which could significantly enhance the success of treatments. The team used computer methods to examine genetic sequences from thousands of people, focusing on amino acids where antibodies attach. They identified genetic variations that could stop therapeutic antibodies from binding successfully.

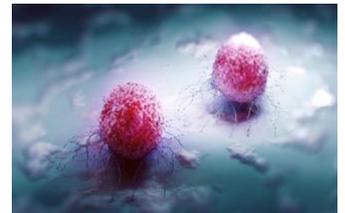


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How Ovarian Cancer Hijacks Belly Tissue to Help Tumors Spread

(University of Basel, January 12, 2026)

Ovarian cancer can take over the belly tissue known as the omentum, turning this crucial organ into a center for tumor growth. A team from the University of Basel and University Hospital Basel, including Dr. Francis Jacob, Professor Viola Heinzlmann-Schwarz, and Dr. Ulrike Lischetti, discovered how the disease reprograms the omentum. This process boosts immune cells that block the body's defense against the tumor and reduces surface and stem cells, helping the cancer spread. Analyzing 36 tissue samples from 15 patients, the researchers mapped the omentum's cellular changes in health and disease.

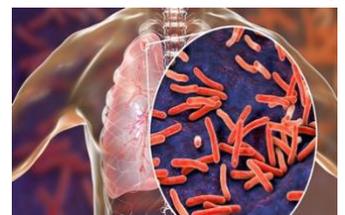


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New Test Outsmarts Antibiotic-Dodging Bacteria

(University of Basel, January 13, 2026)

Some bacteria can avoid antibiotics by appearing inactive, which proves hard to treat. A University of Basel team developed a test that closely monitors these bacteria and provides a new way to select effective drugs. Dr. Lucas Boeck, Dr. Alexander Jovanovic, Dr. Frederick Kodzo Bright, and Dr. Ahmad Sadeghi developed a test that assesses antibiotic effectiveness, including against dormant bacteria that conventional tests might miss. The test, known as 'antimicrobial single-cell testing,' uses microscopic imaging to watch millions of bacteria under thousands of conditions to see if and how fast antibiotics can kill them. This method could change how doctors choose antibiotics for hard-to-treat infections like tuberculosis, ensuring therapies target the specific bacteria in a patient.



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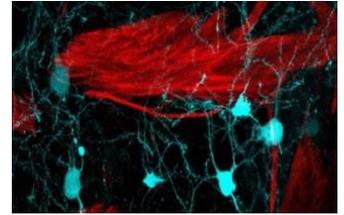


New Evidence on the Onset of Multiple Sclerosis Discovered

(University of Basel, January 15, 2026)

Nearly everyone contracts the Epstein-Barr virus (EBV) in childhood, but only a few develop multiple sclerosis (MS). Researchers from the University of Basel and University Hospital Basel, led by Dr. Hyein Kim, Mika Schneider, Nicholas Sanderson, and Prof. Dr. Tobias Derfuss, found that B cells infected with EBV can attack the central nervous system. These B cells grab myelin antigens, causing lesions similar to those in early MS. This discovery overturns the old view that B cells promote MS mainly by affecting other immune cells, showing instead how EBV directly triggers MS.

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Breakthrough in Tendon Disease Treatment

(ETH Zurich, January 15, 2026)

Researchers at ETH Zurich and Balgrist University Hospital in Zurich, led by Dr. Greta Moschini, have found that the protein HIF1 plays a key role in 'tendinopathy,' a widespread tendon disorder. Their work shows that high levels of HIF1 weaken tendons and makes them less functional, a discovery that also highlights the need for early treatment to prevent irreversible tendon damage. The team adjusted HIF1 protein levels in mice while analyzing the effect of HIF1 in human tendon cells from surgeries. They observed significant impacts from HIF1 on tendons, including altered collagen fiber connectivity and the growth of blood vessels and nerves into the tissue.

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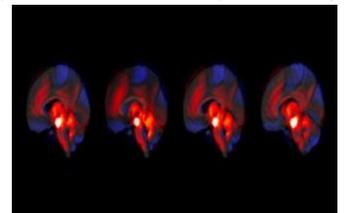


The Cerebellum's Unexpected Role in Schizophrenia

(University of Geneva, January 22, 2026)

Researchers from the University of Geneva and Geneva University Hospitals, led by Dr. Indrit Bègue, Jade Awada, and Dr. Farnaz Delavari, have shown that the cerebellum significantly influences the brain's reward system in schizophrenia. Their work reveals how cerebellar regulation affects the severity of negative symptoms like apathy, social withdrawal, and loss of motivation. Tracking 146 patients over 3-9 months and using neuroimaging on an independent cohort, the team mapped cerebellar connections to the ventral tegmental area (VTA). These findings support developing targeted interventions like transcranial magnetic stimulation (TMS) to address the disorder's most treatment-resistant symptoms.

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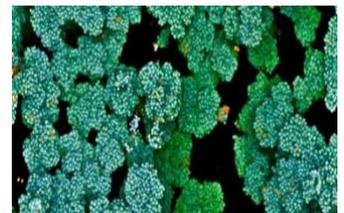


New Treatment against Bacteria that Hijacks Metabolism to Block Healing

(University of Geneva, January 22, 2026)

A common pathogen, *Enterococcus faecalis*, hampers wound healing by using its metabolism to produce hydrogen peroxide, not by releasing toxins. This finding, by researchers from Nanyang Technological University Singapore, the University of Geneva, and the Singapore Center for Environmental Life Sciences and Engineering, shifts focus towards neutralizing the bacterium's harmful by-products rather than fighting it with antibiotics. The team, led by Dr. Thibault Guillaume, Prof. Kimberly Kline, and Prof. Aaron Tan, showed that blocking the bacterium's extracellular electron transport (EET) pathway, which is responsible for hydrogen peroxide production, significantly reduces its ability to disrupt wound healing. Using a genetically modified *E. faecalis* strain that lacks the EET pathway resulted in less hydrogen peroxide production and improved wound healing.

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New Insights into Biofilm Hardening Mechanism in Bacteria

(ETH Zurich, January 26, 2026)

Researchers at ETH Zurich, led by Dr. Eleonora Secchi and her team, discovered that biofilms stiffen in flowing fluids through a passive, physical mechanism, a finding that overturns previous beliefs about their adaptation strategies. This process, significantly influenced by extracellular DNA, could lead to more effective biofilm treatments by targeting their structural matrix. Using microfluidic technology to simulate real-life fluid flow conditions, like those in blood vessels or pipes, the team found that the stiffening of biofilms is a passive reaction to fluid stress rather than an active biological change. This insight opens up new research possibilities for weakening biofilm defenses, presenting a new way to combat infections.

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Neurodegenerative Disease Screening through Skin Biopsy

(University of Geneva, January 28, 2026)

Researchers from the University of Geneva (UNIGE), led by Prof. Andreas Boland, Dr. Xuefeng Zhang, and Dr. Giorgia Melli, have mapped the three-dimensional structure of amyloid deposits in living patients for the first time. This discovery, focusing on transthyretin amyloidosis (ATTR) patients, allows the study of amyloid fibrils in vital organs through a simple skin biopsy. Their findings enable less invasive diagnoses and a real-time view of disease progression and treatment response. The team collected skin biopsies from ATTR patients, isolated fibrils, and analyzed their molecular composition using cryo-electron microscopy. This method revealed proteins in unprecedented clarity, showing the potential for a new diagnostic tool and monitoring amyloid fibrils' response to therapy. UNIGE and USI's work focuses on patient care and real-world applications, offering hope for managing diseases like Alzheimer's and Parkinson's more effectively.

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4. Nano / Micro Technology / Material Science

Safer Receipt Paper from Wood

(EPFL, January 06, 2026)

Researchers, led by Associate Professor Jeremy Luterbacher and team at EPFL, have developed an eco-friendly thermal paper using non-edible biomass. This innovation aims at reducing the environmental impact and at eliminating health hazards associated with traditional bisphenol-based papers. By using lignin and a plant sugar-derived sensitizer, the team has created safer, sustainable alternatives that could replace harmful thermal papers, addressing both environmental and health concerns effectively. The process, named "sequential aldehyde-assisted fractionation," extracts light-colored lignin suitable for printing. Adding diformylxylose, a plant-derived sensitizer, the mixture becomes reactive at printing temperatures. Applied as thin coatings, these new formulations match the performance of conventional thermal papers while drastically reducing toxic effects.

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More Sustainable Epoxy Thanks to Phosphorus

(EMPA, January 19, 2026)

Empa has pioneered a recyclable, flame-retardant epoxy resin, offering a sustainable alternative to traditional, hard-to-recycle epoxies. This new epoxy retains its strength through multiple recycling cycles and can be chemically broken down to reclaim fibers and material. Dr. Arvinth Sekar and his team's development represents a major advancement in materials science by providing a greener solution that reduces plastic waste and pollution. The innovation involves mixing a phosphorus-containing polymer with the epoxy resin before it cures. This addition enables the cured epoxy's polymer chains to rearrange under heat, supporting both thermomechanical reshaping and chemical recycling. This process recovers over 90% of the original materials, including fibers and phosphorus.



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5. Information & Communications Technology

Speaking into a Smartphone Can Detect Low Blood Sugar Levels

(University of Bern, December 01, 2025)

A team led by Prof. Christoph Stettler and Dr. Vera Lehmann from Inselspital, Bern University Hospital, and the University of Bern found that voice changes can indicate early signs of hypoglycemia. They used a machine-learning algorithm to analyze voice recordings from smartphones, advancing non-invasive diabetes management and health monitoring. In their study, 22 individuals with type 1 diabetes either maintained normal blood sugar levels or were induced into hypoglycemia. They provided 540 voice samples via smartphone. The algorithm assessed changes in pitch and clarity, proving voice characteristics can reliably signal low blood sugar. This method opens up new possibilities for accessible health monitoring worldwide with the help of a simple tool for early hypoglycemia detection without the need for advanced medical equipment.



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New Insights into Energy Flow in Semiconductors

(University of Basel, January 21, 2026)

Researchers at the University of Basel and Swiss Nanoscience Institute (SNI), University of Basel, led by Dr. Grazia Raciti, Dr. Begoña A., and Prof. Ilaria Zardo, have observed new mechanisms of energy flow in germanium semiconductors. By tracking energy transfer from electronic systems to atomic lattices, they show how this process alters the frequency of lattice vibrations, intensity, and duration. Using time-resolved Raman spectroscopy and transient reflection spectroscopy, the team accurately measured changes in atomic lattice vibrations and light behavior after ultrafast laser excitation. Their 48-hour experiments, with laser pulses every microsecond, revealed picosecond-scale changes. With the help of computer simulations, they offered a comprehensive view of energy transfer processes. This research could lead to more efficient and precise electronic and phononic components.



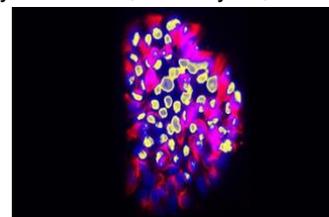
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An AI to Predict the Risk of Cancer Metastases

(University of Geneva, January 23, 2026)

The AI tool, MangroveGS, has been shown to outperform existing methods by predicting cancer metastasis and recurrence with nearly 80% accuracy. Developed by a team from the University of Geneva, with support from various Swiss foundations and institutions, MangroveGS uses gene expression signatures to assess the probability of cancer metastasis accurately. This breakthrough shifts the understanding of cancer from simply "anarchic cells" to a distortion of normal developmental processes, marking a significant advance in cancer treatment. The team's method involved isolating tumor cells from primary colon tumors, cloning, culturing, and then testing these cells for their ability to migrate and form metastases in vitro and in vivo using mouse models. They analyzed the gene expression of several hundred genes across approximately thirty clones to identify specific gene expression gradients. These findings were integrated into MangroveGS, enabling quick assessment of tumor samples and providing oncologists and patients with a metastatic risk score.

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AI that Identifies Bears for Conservation Efforts

(EPFL, January 30, 2026)

Dr. Beth Rosenberg and Assistant Professor Alexander Mathis's team at EPFL and Alaska Pacific University created PoseSwin, an AI that recognizes individual brown bears by their unique features and poses, even with their appearance and behavior changing with the seasons. This innovation enhances wildlife research, management, and conservation by allowing scientists to non-invasively track and study bears, improving our understanding of their behaviors, movements, and populations, which is vital for their habitat management and ecological studies. Using biological knowledge and advanced machine learning, the team focused on stable bear features like muzzle shape and ear placement, and analyzed poses from different angles.

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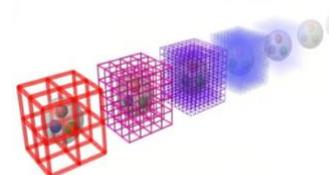


AI Makes Quantum Field Theories Computable

(University of Bern, January 30, 2026)

A team led by Prof. Kieran Holland, Dr. Andreas Ipp, Dr. David Müller, and Prof. Urs Wenger has cracked a long-standing particle physics puzzle using artificial intelligence. This achievement, a collaboration among Technische Universität Wien, University of the Pacific, and University of Bern, represents a significant advance in simulating quantum field theories. By creating a specialized neural network, the team managed to parameterize the action in quantum field theories on a lattice with minimal errors, even on coarse lattices. This breakthrough could enable more precise quantum simulations. The team's method involves a unique neural network designed specifically for quantum field theory simulations on a lattice. This technique adheres to physical laws while efficiently handling the complex array of parameters through AI.

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6. Energy / Environment

Cleaner Biogas Thanks to New Analytical Method

(Paul Scherrer Institute, December 01, 2025)

Dr. Ayush Agarwal and Dr. Christian Ludwig, from the Paul Scherrer Institute and the Center for Energy and Environmental Sciences, have created a new method that detects tiny amounts of harmful impurities like sulfur compounds and siloxanes in biogas. This innovation allows small biogas plants to meet strict quality standards affordably, promoting biogas as a viable renewable energy source. Their technique uses gas chromatography and inductively coupled plasma mass spectrometry (ICP-MS) to pinpoint and measure trace impurities. By vaporizing biogas and breaking it into charged particles, the method quantifies specific elements with a mass spectrometer. This precise detection enables small facilities to monitor and enhance biogas quality, facilitating its use in the natural gas grid and advancing the shift to renewable energy.

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Zurich's Innovative CO2 Monitoring for Climate Action

(EMPA, December 10, 2025)

For the first time, the city of Zurich can directly monitor its CO2 emissions through atmospheric observations, revolutionizing how cities worldwide can track and verify climate action impacts in real-time. Led by Dr. Lukas Emmenegger and Dr. Dominik Brunner, the team demonstrated that atmospheric measurements could reliably determine city-wide CO2 emissions, closely matching previously calculated values. This innovation allows Zurich to accurately monitor its greenhouse gas emissions, supporting its goal to achieve net zero emissions by 2040. The team installed a network of advanced sensors across Zurich to measure CO2 levels and the exchange with the atmosphere. They used three model systems, ICON-ART for atmospheric transport, GRAMM/GRAL for CO2 transport modeling at the building level, and Eddy flux for direct CO2 flow measurement, and achieved unparalleled precision in urban CO2 monitoring.

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A Comprehensive Energy System Model for Switzerland

(Paul Scherrer Institute, January 20, 2026)

Just over fifteen years ago, Switzerland's energy future planning was a mere dream. Today, the Paul Scherrer Institute and its partners have introduced the Swiss TIMES Energy system Model (STEM), developed by Dr. Stefan Hirschberg, Dr. Ramachandran Kannan, and Dr. Evangelos Panos. This model offers a detailed view of Switzerland's energy landscape, covering electricity, transport, buildings, and industry. It's a pivotal tool for creating strong, affordable, and socially viable energy paths to a net-zero future, marking a major advance in national energy research. STEM uses a technology-rich, dynamic approach to simulate long-term energy transition scenarios with exceptional accuracy. It combines with other analytical tools like Computable General Equilibrium models and life-cycle assessments for a comprehensive future outlook. This model goes beyond predicting energy use; it delves into consumer behavior, flexible demand, and the economic effects of energy policies.

[/web/2026/06-260120-28](#)





A Stress Test for High-performance Batteries

(EMPA, January 26, 2026)

Researchers at Empa, METAS, Physikalisch-Technische Bundesanstalt, PTB and their partners, led by Dr. Artur Braun have developed new analytical methods to study recyclable batteries. Their technique, akin to a "stress ECG" for batteries, enhances our understanding of battery materials and their behavior during use. This innovation marks a significant step towards climate-neutral mobility and supports the shift to renewable energy, aligning with the EU Green Deal and Switzerland's 2050 climate neutrality goal. Using a unique mix of radiation and electroanalytical techniques 'in operando,' the team tracks the battery's electrochemical and mechanical changes during charging. This method provides insights into how various materials and structures withstand stress. This advancement not only leads to the creation of more efficient, durable batteries but also opens doors for the large-scale production of next-gen battery technologies, potentially transforming the energy sector and boosting global sustainability efforts.

[/web/2026/06-260126-6d](#)



7. Engineering / Robotics / Space

Helium Clouds Escape Distant Exoplanet

(University of Geneva, December 02, 2025)

Researchers at the University of Geneva (UNIGE) and their colleagues, led by Dr. Yann Carteret and Dr. Vincent Bourrier, have discovered helium clouds escaping from the exoplanet WASP-107b using the James Webb Space Telescope (JWST). This marks the first time helium is detected on an exoplanet with the JWST. Understanding these dynamics helps assess the potential for life on distant worlds. The team used the JWST to study WASP-107b's atmosphere, applying UNIGE-developed tools to confirm helium outflows and detect other atmospheric chemicals. This research sheds light on the mechanisms that form and alter exoplanet atmospheres, which helps predict which planets might maintain their atmospheres and possibly harbor life.

[/web/2025/07-251202-a6](#)



From Seafood Waste to Robotic Devices

(EPFL, December 05, 2025)

Turning seafood waste into robotic innovation, researchers at EPFL have developed robots using langoustine shells. Led by Dr. Sareum Kim and Assistant Professor Josie Hughes, their work includes manipulators, grippers, and a swimming robot, all showcasing the strength and flexibility of crustacean exoskeletons. This advance promotes sustainability by recycling food waste and explores the potential of natural materials in robotics, pushing the field towards bio-hybrid solutions. The team embedded elastomers in the shells and attached them to motors, allowing for adjustable stiffness. A silicon layer enhances durability, enabling these robots to handle various objects, adapt to different sizes, and swim at speeds up to 11 cm/s. This innovation paves the way for more sustainable and efficient robots, merging the design of biological materials with robotics. EPFL's work marks a significant step in combining sustainability with technological advancement, promising a new direction for bio-hybrid robotics.

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New Insights into Proxima b's Atmosphere

(University of Geneva, December 09, 2025)

The RISTRETTO project at the University of Geneva has pioneered a technique to detect exoplanets like Proxima b and potentially find oxygen or water in their atmospheres. Dr. Nicolas Blind, Dr. Maddalena Bugatti, and Associate Professor Christophe Lovis led the team in this groundbreaking effort, likening it to spotting a firefly next to a lighthouse from miles away. This achievement presents new possibilities for understanding the habitability of planets around distant stars. Using a new coronagraphic Integral Field Unit and extreme adaptive optics, the team was able to minimize stellar glare and atmospheric distortion. They directed light through a mosaic of hexagonal lenses and optical fibers, demonstrating RISTRETTO's ability to identify the atmospheric components of Proxima b. This method marks a significant leap in our quest to discover life-sustaining elements on exoplanets and sets the stage for the development of advanced astronomical tools for the Extremely Large Telescope.



[/web/2025/07-251209-63](#)

Turning a Close Encounter into Planetary Defense Research

(University of Bern, January 06, 2026)

On April 13, 2029, the asteroid Apophis will closely pass Earth, offering a rare opportunity to study it. Researchers Dr. Antoine Pommerol and Dr. Martin Jutzi from the University of Bern, alongside teams at the European Space Agency - ESA, and the Japan Aerospace Exploration Agency, will collaborate in the RAMSES mission to see how Earth's gravity affects Apophis. They aim to examine changes in its orbit, analyze its surface, and study physical features, including the risk of debris avalanches. This effort is crucial for creating ways of protecting the Earth from future asteroid impacts. For this mission, the University of Bern will develop a high-resolution imaging system named CHANCES, that will be used to study the asteroid's surface at various wavelengths, determining its mineral content and characteristics. They will also run simulations to assess the effects of space probes on asteroids and develop deflection techniques.



[/web/2026/07-260106-21](#)

Longest Observation of an Active Solar Region

(ETH Zurich, January 06, 2026)

A super storm from the sun lit up Earth's skies in May 2024. Researchers at ETH Zurich, IRSOL in Locarno, and the Davos Physical Meteorological Observatory, led by Dr. Ioannis Kontogiannis, and Prof. Louise Harra, were able to capture the longest continuous observation of a superactive solar region, NOAA 13664. This observation sheds new light on the dynamics of superactive solar regions and advances our ability to forecast space weather. The team used the Solar Orbiter and NASA's Solar Dynamics Observatory to keep a 94-day watch over the turbulent solar region from its inception to dissolution. This combined effort provided a continuous data stream, detailing the region's evolution and the mechanisms driving such powerful solar activity. Their breakthrough could lead to more accurate solar storm predictions, with the hope to better mitigate their impact on Earth's technological infrastructure.



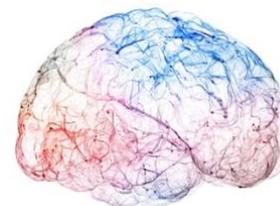
[/web/2026/07-260106-0f](#)

8. Physics / Chemistry / Math

High-Resolution Brain Mapping Within Reach

(Paul Scherrer Institute, December 05, 2025)

Researchers at the Paul Scherrer Institute, Swiss Light Source, and The Francis Crick Institute, led by Dr. Adrian Wanner and Dr. Ana Diaz, have developed a new method to map brain tissue in 3D with unparalleled resolution. Their technique surpasses previous X-ray limitations, allowing for the non-destructive examination of brain slices up to 10 microns thick at a detailed resolution of 38 nm. This advancement reveals the brain's complex network and offers new paths to understanding neurological diseases like Alzheimer's. The team's method involves infusing brain tissue with a radiation-resistant epoxy resin, imaging at -178 degrees Celsius with liquid nitrogen, and using a powerful reconstruction algorithm to adjust for deformations. The key technology, X-ray ptychography, benefits from the Swiss Light Source's upgrade to a 4th-generation synchrotron, enabling high-resolution, non-destructive imaging of larger brain tissue samples. This pioneering work by the Paul Scherrer Institute marks a significant leap in connectomics, providing deep insights into the brain's intricate 3D structure and functionality.



[/web/2025/08-251205-e1](#)

Electron Lag Discovery Could Reshape Future Electronics

(ETH Zurich, January 07, 2026)

Researchers have found a delay in response of electrons to atomic nuclei motion, challenging a core principle of quantum mechanics. The team from ETH Zurich and the Max Planck Institute for Physics, led by Dr. Sergej Neb, Dr. Ursula Keller, and Dr. Lukas Gallmann, discovered for the first time that in materials called 'MXenes' and other two-dimensional materials, electrons lag by up to thirty femtoseconds depending on their energy states and position. This finding contradicts the Born-Oppenheimer approximation and marks a significant shift in understanding electron-phonon interactions. Using attosecond spectroscopy and theoretical calculations, the researchers shone a short infrared laser pulse to excite lattice vibrations, followed by an extreme ultraviolet attosecond pulse to measure light transmission. By varying the time between these pulses, they accurately measured the electron delay. This breakthrough enhances precise electron behavior models and could enable the development of smaller, more efficient electronics.

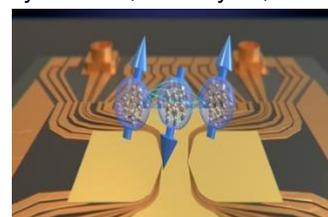


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Entangled Clouds for Precision Measurements

(University of Basel, January 26, 2026)

For the first time, researchers have used spatially separated entangled atomic clouds for quantum measurements, surpassing the previous constraint of entanglement within the same location. The team, including Prof. Dr. Philipp Treutlein, Prof. Dr. Alice Sinatra, and Dr. Yifan Li from the University of Basel and Kastler Brossel Laboratory, showed that entangling the spins of atomic clouds can simultaneously measure multiple physical parameters with greater precision. This method specifically enhances the measurement of electromagnetic field variations, challenging our quantum mechanics understanding and paving the way for advanced high-precision scientific tools. The researchers entangled atomic clouds' spins, divided them into three interconnected parts, and demonstrated that this spatial separation significantly improves measurement precision over traditional techniques. This insight in quantum metrology could enhance the accuracy of critical instruments like optical lattice clocks and atom interferometers, essential for precise timekeeping and measuring Earth's gravitational pull.



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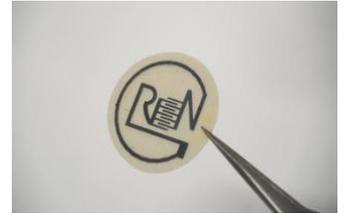
11. Start-ups / Technology Transfer / IPR / Patents

A Biodegradable Smart Sensor to Monitor Sensitive Goods

In 2022, the world generated 62 megatons of e-waste, equivalent to 16 Eiffel towers daily, with only 22% recycled. A team led by Dr. Danick Briand, Dr. James Bourely, and Dr. Nicolas Fumeaux at EPFL, Empa, and CSEM has created a wireless, chipless, and biodegradable smart sensor tag for detecting exceeded temperature thresholds. This advance not only confronts the e-waste crisis but also opens doors for eco-friendly Internet-of-Things applications. Crafted from a mix of biopolymer and cellulose fibers, the sensor uses a wireless electrical resonator with zinc tracks, shielded by natural wax. It signals temperature overages by changing frequency when a solid bio-based oil melts and coats the circuit.

[/web/2025/11-251202-61](#)

(EPFL, December 02, 2025)



Wirelessly Charged EVs that Help Balance the Electricity Grid

Swiss electric cars now charge wirelessly with an efficiency of about 90%, comparable to traditional cable charging. Researchers from Empa and Eniwa AG, supported by the Swiss Federal Office of Energy SFOE, the cantons of Zurich and Aargau, and led by Mathias Huber, showed that wireless inductive charging works as well as cable charging in real conditions. This breakthrough simplifies charging for electric vehicle (EV) owners and allows cars to support the electricity grid during high demand. The INLADE project successfully integrated wireless charging into daily use, overcoming technical and regulatory challenges. By equipping EVs with receiver coils that connect with ground transmitters, charging starts automatically when the car parks. The team ensured the system's safety for people and animals nearby through extensive testing.

[/web/2025/11-251204-ef](#)

(EMPA, December 04, 2025)



Innovative System Converts CO2 to Minerals and Clean Hydrogen

Dr. Luc Bondaz and Dr. Suhas Nuggehalli Sampathkumar from EPFL startup DeltaSpark have created a system that turns CO2 emissions into solid minerals and clean hydrogen quickly at nearly ambient temperatures. This innovation meets the urgent need for efficient carbon capture and storage, and could play a key role in hitting Paris Agreement goals with a cost-effective method for factories. Their breakthrough uses electrolysis for rapid mineralization at close to room temperature, transforming CO2 gas into stable ions that quickly react with metals to form minerals, while also producing clean hydrogen. The system's compact size allows for easy setup at emission sites, offering a sustainable solution for CO2 storage and clean hydrogen production.

[/web/2025/11-251208-23](#)

(EPFL, December 08, 2025)



Data Transmission with 3D Magnon Diodes

(EPFL, December 10, 2025)

Scientists from EPFL and the Max Planck Institute for Chemical Physics of Solids have developed the first 3D magnon diode that encodes data at room temperature. By applying a new method that gives non-chiral materials like nickel chirality through geometry, this innovation could enable high-speed, efficient, and low-energy data transmission. The team behind this advancement includes Dr. Huixin Guo, Dr. Mingran Xu, and Axel Deenen. The researchers created ferromagnetic tubes by 3D-printing a twisted polymer rod and coating it with nickel. This method is suitable for mass production and works with existing chip technologies at room temperature, avoiding the need for special materials or strong magnetic fields.

[/web/2025/11-251210-0c](#)



New Technique Enables Rapid 3D Imaging of Bones

(Paul Scherrer Institute, January 13, 2026)

Researchers at the Paul Scherrer Institute, led by Prof. Dr. Marianne Liebi, Dr. Christian Appel, and Dr. Meitian Wang, have developed a new X-ray diffraction technique that cuts down the mapping time of biological materials' 3D nanostructure from a day to just over an hour. This enables a detailed view of the alignment of collagen fibers in bones, illuminating their structural integrity from the nanometer to the millimeter scale. The technology enhances our understanding of bone diseases and could help develop better implants.

[/web/2026/11-260113-d2](#)



Innovative Robotic Textiles

(EPFL, January 22, 2026)

Researchers at EPFL's Soft Transducers Lab, led by Huapeng Zhang and Prof. Herbert Shea, have developed a fabric that can lift over 400 times its own weight. A 4.5-gram piece lifts a 1kg bag by contracting 50%, achieved through shape memory alloy (SMA) fibers woven in an X-crossing pattern. This design enables unprecedented strength-to-weight ratios in textile actuators. The team arranged SMA fibers in a periodic X-pattern where each fiber crossing contributes force in the direction of movement. The fabric extends to 160% of its original length and uses temperature-activated phase transitions to control stiffness.

[/web/2026/11-260122-17](#)



12. General Interest

Natural Light Beneficial for People with Type 2 Diabetes

(University of Geneva, January 08, 2026)

A study shows that natural light significantly boosts metabolic health in type 2 diabetes patients, which presents a simple but powerful way to manage the condition. The University of Geneva, University Hospitals of Geneva, Maastricht University, and the German Diabetes Center conducted the research. The research involved 13 type 2 diabetes patients over 65 who lived for 4.5 days in environments with either natural or artificial light, maintaining the same lifestyle habits. Analysis of blood and muscle samples showed that natural light enhances metabolic health by regulating molecular clocks, lipids, metabolites, and gene transcripts.

[/web/2026/12-260108-e0](#)





Upcoming Science and Technology Related Events

WWRP Weather and Society Conference 2026

February 23-27

<https://www.weatherandsociety.com/>

Business & Economy, Environment & Climate
Conditions

Venue to be announced in Geneva

Terra Solid

February 24-26

<https://www.terrasolid.ch/de>

Environment & Climate Conditions, Industrial
Products & Engineering

Messe Luzern AG

Swiss Hydrogen Summit

February 25-26

<https://h2-summit.ch/>

Scientific, Research & Development, Power,
Renewable & Storage Energy

The Dolder Grand Zurich

FINANZ'26

February 25-26

<https://www.finanz-ch.ch/>

Finance, Banking, Investment & Insurance
Zurich Convention Center

International Cooperation Forum

February 26-27

<https://is.gd/EZIM6d>

Business & Economy, Research & Development

Venue to be announced in Geneva

Humanitarian Networks and Partnerships Weeks 2026

March 2-12

<https://is.gd/azqLwa>

Human Resources, Education & Training,
Humanitarian Law, Human Rights, Migration
Geneva International Conference Center

The health.tech 2026 Global Summit

March 3-5

<https://www.health.tech/>

Life Sciences, Health Care & Medical
Congress Center Basel

AMR Conference

March 3-4

<https://amr-conference.com/>

Pharmaceutical & Biotechnology, Life Sciences,
Health Care & Medical
Congress Center Basel

World Immune Regulation Meeting

March 11-14

<https://www.wirm.ch/>

Life Sciences, Health Care & Medical
Congress Center Davos

START Summit 2026

March 19-20

<https://www.startglobal.org/start-summit>

Finance, Banking, Web & Electronic, AI
Olma Messen St. Gallen

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