



ETH Zurich Develops the Fastest Possible Algorithm for Network Flow Problems

(ETH Zurich, July 01, 2024)

Researchers Prof. Dr. Rasmus Kyng and Dr. Maximilian Probst Gutenberg at ETH Zürich have made a significant breakthrough in theoretical computer science. They have developed a superfast algorithm capable of calculating the optimal, lowest-cost traffic flow for any network, including rail, road, water, or the internet, at unprecedented speeds. The researchers' algorithm achieves almost-linear-time computations of optimal flows for dynamic networks. This advancement is crucial for highly complex and data-rich networks that change rapidly, such as molecular structures, brain connections, or social relationships. This breakthrough algorithm has been designated as one of the ten biggest discoveries in computer science in 2022 by magazine Quanta.

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Mining Rare Earth Metals from Electronic Waste

(ETH Zurich, July 15, 2024)

A groundbreaking study by researchers from ETH Zürich, led by Professor Victor Mougél and Marie Perrin, has unveiled an innovative method for separating and recovering rare earth metals from electronic waste. This technique allows for the extraction of europium from old fluorescent lamps in significantly higher quantities than existing methods. This approach holds promise for more efficient recycling of various rare earth metals, which are crucial for digitalization and the energy transition. Moreover, the researchers are in the process of founding a startup called REEcover to implement their findings on an industrial scale.

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Nanoparticles Pose a Risk to Pregnancy

(EMPA, June 12, 2024)

An interdisciplinary team led by researchers at Empa has made a significant breakthrough in understanding the risks of nanoparticles on pregnancy. Collaborating with clinical partners from the Cantonal Hospital of St. Gallen and research partners from the University of Geneva, the Amsterdam University Medical Center, and the Leibniz Institute for Environmental Medical Research in Düsseldorf, the team discovered that certain nanoparticles impair the release of chemical messengers in the placenta, affecting blood vessel formation. This research was conducted using fully functional human placentas obtained after planned caesarian sections. The findings are crucial as they highlight the long-range effects of nanoparticles and their potential harm to embryonic development. The experiments revealed that nanoparticles in placental tissue disrupt the production of a large number of substances, marking a significant advancement in our understanding of nanoparticle toxicity and its implications for reproductive health.

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1. Policy

Safeguarding Swiss Public Service in the Digital Era

(EPFL, July 16, 2024)

Researchers at EPFL, led by Prof. Emeritus Matthias Finger and Melanie Kolbe-Guyot, PhD, have developed comprehensive recommendations for maintaining high-quality public service amidst digitalization and the rise of service platforms. This policy paper highlights the challenges posed by these new technologies and their potential impact on the quality of traditional physical services. The research emphasizes the importance of a unified strategy involving both cantonal and federal administrations to tackle these challenges. Key recommendations include creating a federal organizational unit responsible for digitalization policies, ensuring data sharing between private platforms and public services, negotiating fair profit-sharing to fund infrastructure, enforcing price transparency, and guaranteeing equal treatment of citizens.

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2. Education

Uncovering Grading Bias in Schools

(University of Bern, July 09, 2024)

A study led by Dr. Richard Nennstiel from the University of Bern and Dr. Sandra Gilgen from the University of Zurich, has revealed significant grading biases. Analyzing data from over 14,000 ninth graders in Germany, the research unveils how factors such as gender, body size, ethnicity, and parental socioeconomic status influence teacher-assigned grades. This extensive study utilized data from the National Educational Panel Study in Germany, focusing on a representative sample of ninth graders in 2010. The findings are substantial: students with multiple intersectional identities received noticeably lower grades, irrespective of their actual academic ability. Additionally, pronounced gender biases were evident, with these disadvantages accumulating over time.

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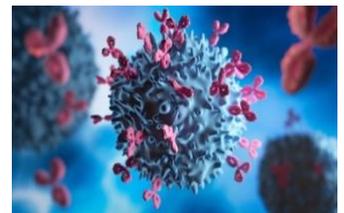
3. Life Science

Innovating Cancer Therapy with Antibody-Peptide Inhibitors

(EPFL, June 04, 2024)

Scientists at EPFL, led by Prof. Dr. Elisa Oricchio, Prof. Dr. Bruno Correia, and Aaron Petruzzella, have developed a groundbreaking solution for targeting cancer cells. By utilizing antibody-peptide inhibitor conjugates, they can specifically target cancer-promoting enzymes called cathepsins, promising improved cancer treatment. The innovative approach revolves around the use of antibody-peptide inhibitor conjugates, which can be tailored to target a range of proteases implicated in various diseases. This method is crucial as it selectively blocks the activity of essential proteins in cancer cells without disrupting their function in healthy tissues. Funded by the Swiss National Science Foundation and the Leenaards Foundation, this research has paved the way for two patent applications and is heading closer to clinical application, potentially revolutionizing treatments beyond cancer.

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Innovative Stem Cell Therapy for Osteoarthritis

(University of Geneva, June 04, 2024)

Researchers at the University of Geneva, led by Prof. Dr. Eric Allémann, have unveiled an exciting breakthrough in osteoarthritis treatment. By modifying glucose and attaching it to hyaluronic acid, they have significantly increased the lifespan of stem cells in nutrient-poor environments like osteoarthritic joints. The team conducted detailed laboratory experiments to test the modified glucose, discovering that stem cells survived for more than three days, effectively releasing growth factors and activating molecules crucial for cartilage regeneration. This pioneering approach is a significant step forward for regenerative therapies, offering new prospects for those suffering from osteoarthritis.



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AI Enhances Fossil Record Analysis

(University of Fribourg, June 05, 2024)

Researchers at the University of Fribourg, led by Dr. Rebecca Cooper and Prof. Dr. Daniele Silvestro, in collaboration with the SIB Swiss Institute of Bioinformatics, have achieved a groundbreaking advancement in understanding hidden biodiversity through the use of artificial intelligence. Their innovative work employs the DeepDive program to fill the gaps in fossil records, addressing the uncertainties and limitations that have long hindered studies in this field. By utilizing AI, they have significantly improved our understanding of how biodiversity has changed over geological time. This breakthrough is crucial as it paves the way for new insights in biological research and evolution.



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Leading the Way in Research on Aging

(University of Zurich, June 05, 2024)

A 12-year research project conducted by the University of Zurich's Research Priority Program (URPP) Dynamics of Healthy Aging, led by Director Prof. Dr. Mike Martin, has set new paradigms in the field of aging. This extensive study focused on understanding and promoting ways for individuals to age healthily and maintain a high quality of life into their older years. Through interdisciplinary collaboration spanning psychology, law, earth sciences, ethics, data science, and medicine, the research has made significant strides. Among the key achievements is the development of a healthy aging model adopted by the World Health Organization, positioning the University of Zurich as a pioneer.



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Pollen Exposure Increases Blood Pressure

(University of Basel, June 06, 2024)

Researchers from the University of Basel and the Swiss Tropical and Public Health Institute (Swiss TPH), led by Prof. Dr. Marloes Eeftens, have unveiled a crucial link between pollen exposure and elevated blood pressure. This discovery has significant implications for public health, especially in the context of urban planning and biodiversity. The study involved 396 adults from the Basel region, with 302 participants reporting a pollen allergy. Blood pressure measurements were taken repeatedly during the pollen seasons of 2021 and 2022, while sensitization to various pollen types like grasses, birch, and hazel was determined using a skin prick test. The findings underscore the growing issue of pollen allergy exacerbated by climate change, leading to longer and more intense pollen seasons.



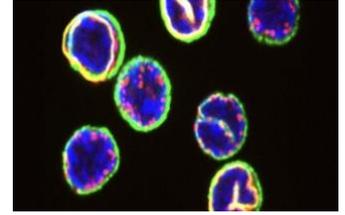
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Key Differences in the Inner Workings of Immune Cells Identified

(ETH Zurich, June 07, 2024)

Researchers at ETH Zürich, led by Prof. Dr. Berend Snijder and Dr. Ben Hale, have identified crucial differences in the inner workings of cytotoxic T cells. Through advanced machine-learning techniques, they discovered that over half of these killer T cells have nuclear invaginations, which enable faster and stronger responses to pathogens. This innovative study revealed that this specific cellular architecture allows a heightened influx of calcium ions, contributing to more effective immune responses. The research is pivotal to understanding immune cell behavior and holds promise for developing more clinically effective therapies for conditions like blood cancer. Moreover, it raises intriguing questions about how the body maintains these structural variations among cytotoxic T cells.



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Studying the Safety of Diabetes Medications During Pregnancy

(University of Lausanne, June 07, 2024)

The Swiss Teratogen Information Service (STIS) at the University of Lausanne and the Lausanne university hospital, led by Dr. Ursula Winterfeld and Dr. Kim Dao, have conducted a pivotal study on the safety and risks associated with using GLP1-RA medications for weight loss during pregnancy. In collaboration with birth defect monitoring services in Berlin, Newcastle, Israel, and Bergamo, the team followed 168 pregnancies of women exposed to GLP1-RA medication in the first trimester. Their research found no increased risk of malformation or miscarriage in the children. This is crucial as it provides reassurance about the safety of these medications, particularly as overweight and obesity become more prevalent among women of childbearing age.

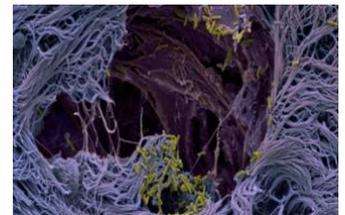


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How Pathogens Infect Human Lung Tissue

(University of Basel, June 11, 2024)

A study led by Prof. Dr. Urs Jenal at the University of Basel has revolutionized how we understand pathogen infection in human lung tissue. The research team's development of a biosensor to monitor the small signaling molecule c-di-GMP in individual bacteria marks a significant technological breakthrough. Employing this biosensor, researchers can now track real-time changes and regulation of c-di-GMP during infections, giving unprecedented insight into pathogenic behavior. The study utilized human lung organoids to replicate patient conditions, allowing for a nuanced investigation of antibiotic effects and bacterial survival. Published in Nature Communications, these findings are crucial for devising new strategies to combat lung infections.



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The First Week after Birth Is Critical for the Development of the Senses

(University of Zurich, June 12, 2024)

Researchers from the University of Zurich, led by Prof. Dr. Theofanis Karayannis from the Brain Research Institute, have unveiled a close link between the maturation of the senses of smell and touch in mice, particularly during the first week after birth. They discovered that odors triggered neural activity across a large part of the cerebral cortex in newborn mice, including areas responsible for touch. Utilizing state-of-the-art wide field-of-view imaging, the team mapped brain cell activity patterns, observing that this cross-sensory activation window was limited to the early postnatal period.



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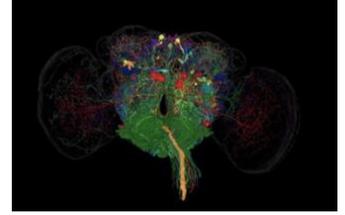


Fruit Fly Brain Shows How Simple Commands Turn into Complex Behaviors

(EPFL, June 13, 2024)

Led by Professor Pavan Ramdya of the EPFL Brain Mind Institute, a team of researchers has made a pivotal discovery on how networks of neurons in fruit flies convert simple brain signals into coordinated behaviors. This groundbreaking study offers new insights into the neural mechanisms that drive complex actions. Using the fruit fly, *Drosophila melanogaster*, as a model organism, the research focused on the role of descending neurons (DNs) in transforming command-like signals into population-based behavioral control. Funded by the Boehringer Ingelheim Fonds and the Swiss National Science Foundation SNSF, this work has potential applications in both robotics and understanding human motor disorders. By exploring these processes in fruit flies, researchers can derive insights relevant to more complex organisms and potentially advance the development of robotic systems.

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Getting a Better Understanding of Brittle Bone Disease

(ETH Zurich, June 14, 2024)

Led by Prof. Dr. Xiao-Hua Qin at ETH Zürich, the Swiss National Research Programme “Advancing 3R” has made pioneering strides in the study of brittle bone disease (osteogenesis imperfecta or OI) and degenerative bone diseases like osteoporosis. Their groundbreaking research has culminated in the development of a three-dimensional in vitro model for bone development, utilizing cells from individuals affected by OI. This innovative model was constructed using a porous matrix made of a soft hydrogel. Osteoblasts settled, multiplied, and interconnected within this matrix, forming a comprehensive three-dimensional network. This advancement eliminates the need for costly and ethically challenging animal experiments. By incorporating the 3R approach (Replace, Reduce, Refine), this research promises a deeper understanding of bone formation, development, and degradation. Ultimately, it aims to create robust in vitro models that could redefine bone disease research and therapy development.

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Understanding the Genetic Switch of Bone Growth

(University of Geneva, June 17, 2024)

Researchers at the University of Geneva, led by Assistant Professor Guillaume Andrey and first author Dr. Fabrice Darbellay, have made a groundbreaking discovery in the field of bone development. In collaboration with the Swiss 3R Competence Centre, they developed a novel experimental technique to isolate and analyze genetic “switches” in bone growth using mouse embryos with fluorescent bones. By monitoring chromatin activity in these fluorescent bone cells, the team was able to identify regulatory sequences that control the genes involved in bone formation. This crucial finding not only enhances our understanding of genetic regulation in bone development but also holds promise for future medical treatments related to bone growth and development.

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Inequalities in Quality of Life for Women with Early Breast Cancer

(University of Geneva, June 19, 2024)

Researchers from the University of Geneva and Université Paris-Saclay, led by Dr. José L. Sandoval, have conducted a significant study on the disparities in quality of life experienced by women with early breast cancer. Dr. Sandoval, an oncologist at the Geneva University Hospital and a researcher at the University of Geneva's Faculty of Medicine, was the principal researcher in this study. The team tracked nearly 6,000 women who were treated for early breast cancer in France over a period of two years. By examining their quality of life at diagnosis and in the subsequent two years, the study reveals the profound impact of social inequalities. This research highlights the importance of addressing these disparities to improve patient outcomes.



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Interaction with Insects Accelerates Plant Evolution

(University of Zurich, June 20, 2024)

A team led by biologist Dr. Florian Schiestl at the University of Zurich has conducted a fascinating study on how interactions with pollinators and herbivorous insects influence plant adaptation to different soil types, leading to the development of ecotypes. The researchers discovered that plants pollinated by bumblebees exhibit significant differences when grown on limestone versus tuft soil. This demonstrates that insect interaction accelerates plant evolution. They also identified several key genes involved in this adaptation process. This important research, funded by the Swiss National Science Foundation SNSF, sheds light on the impact of biotic interactions on plant adaptation to abiotic factors and underscores the importance of diverse interactions for effective adaptation.



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Alarming Situation for Children in Sub-Saharan Africa

(University of Geneva, June 21, 2024)

A study conducted by the Department of Paediatrics, Gynaecology, and Obstetrics at the University of Geneva, alongside Dr. Galetto Annick, has shed light on the alarming presence of resistant Enterobacteria in severe infections in children in Sub-Saharan Africa. The research team systematically reviewed 1,111 studies published between 2005 and 2022, retaining 122 studies and analyzing data from over 30,000 blood, urine, and stool samples from infected children. This critical research exposes the dire situation of antibiotic resistance in the region, emphasizing the urgent need for new treatment strategies and public health interventions to combat this escalating issue.



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Innovative Diagnostic Procedure for Kidney Stones

(EMPA, June 24, 2024)

Researchers at Empa, led by Dr. Robert Zboray, have developed a groundbreaking diagnostic procedure for kidney stones. Backed by the Maiores Foundation, this project aims to revolutionize the precise, cost-effective, and painless detection of kidney stones. The research centers on dark-field X-ray imaging, a cutting-edge technology that can accurately determine the content, shape, and position of kidney stones in patients. The vision is to retrofit standard X-ray machines in offices of general practitioners and hospitals with this innovative technology as cost-effectively as possible.



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How the Brain Prioritizes Immediate Goals

(University of Geneva, June 25, 2024)

Researchers led by Prof. Dr. Alison Montagrin from the University of Geneva and the Icahn School of Medicine at Mount Sinai Hospital have made an exciting discovery about the brain's processes. Their study unveils how the brain distinguishes and prioritizes goals to be achieved in the past, present, or future. Through observing individual reaction times and using very high-resolution MRI imaging, the researchers were able to investigate cerebral activity in great detail. They found that the brain recognizes immediate goals more quickly than distant ones. This breakthrough is crucial for understanding psychiatric disorders like depression, which can impede goal formulation. Insights from this research could lead to new treatments and approaches for these conditions.

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Novel Blood Test Helps Improve Cancer Treatments

(University of Zurich, July 02, 2024)

Researchers at the University of Zurich and the University Hospital Zurich, led by Professor Panagiotis Balermipas, have developed an innovative blood test to enhance cancer treatments. This novel liquid biopsy method analyzes DNA fragments in the bloodstream to determine tumor activity, distinguishing between less and more aggressive metastatic cancer. The research team tested their groundbreaking method on patients undergoing radiotherapy, including several HPV-positive individuals. They discovered that higher concentrations of HPV DNA in the blood might signal early cancer recurrence, especially for head and neck cancers. This discovery is crucial as it allows for a personalized assessment of therapy benefits and risks while enabling regular monitoring of treatment success, leading to more tailored and effective cancer treatments.

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Exercise Prevents Nerve Damage During Cancer Therapy

(University of Basel, July 02, 2024)

A groundbreaking study led by Dr. Fiona Streckmann from the University of Basel and the German Sport University Cologne reveals that specific exercise regimens can prevent nerve damage caused by chemotherapy. This significant finding could reshape supportive cancer care treatments, enhancing patient quality of life. Involving 158 cancer patients undergoing treatment with oxaliplatin or vinca-alkaloids, the study divided participants into three groups: one receiving standard care, and two others completing bi-weekly exercise sessions focused on either balancing or resistance exercises. The results demonstrate the potential of physical exercise in preventing chemotherapy-induced neuropathy, a common and persistent side effect where medication has shown limited effectiveness. The research team is also developing hospital guidelines to integrate these exercises into clinical practice, aiming to increase the employment of sports therapists in hospitals.

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Why Schizophrenia and Apathy Go Hand in Hand

(University of Geneva, July 04, 2024)

The University Hospitals of Geneva, in collaboration with researchers from Charité Berlin, have made a significant breakthrough in understanding the neural bases of schizophrenia. Led by Prof. Dr. Mariia Kaliuzhna and Dr. Stefan Kaiser from the Department of Psychiatry at HUG, the team discovered how the brains of individuals with schizophrenia struggle to discriminate between different levels of reward, leading to apathy and lack of motivation. Utilizing neural imaging and behavioral studies, the researchers uncovered these subtle neural dysfunctions, which manifest in significant everyday challenges for those affected. This groundbreaking study highlights the potential of brain stimulation and targeted psychotherapy as treatments to address these less visible but debilitating symptoms.

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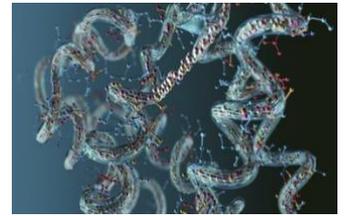


Breakthrough in Predicting Protein Interactions with AI

(EPFL, July 05, 2024)

Scientists at EPFL, including Dr. Anne-Florence Bitbol, Dr. Umberto Lupo, and Damiano Sgarbossa, have made a significant stride in computational biology. They developed an innovative AI method called DiffPALM, which enhances the prediction of protein interactions. Combining advanced machine learning techniques with efficient handling of complex biological data, DiffPALM stands to revolutionize basic protein biology research. The implications extend into medical applications, drug development, and disease treatment. The researchers have made DiffPALM freely available, inviting widespread adoption to further advancements in the field.

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How Our Brain Decodes Other People's Gaze

(University of Geneva, July 05, 2024)

Researchers at the University of Geneva, led by Dr. Domilė Tautvydaitė, have made significant advancements in comprehending how the brain detects and interprets the direction of other people's gaze. This study has determined the exact moment when the brain identifies another person's gaze direction with unparalleled precision. The research revealed that the brain initially processes global visual cues, such as the orientation of the head, before concentrating on more localized information, such as the eyes. This discovery is crucial for enhancing our understanding of autism spectrum disorders, potentially offering new insights into the neural mechanisms linked to reduced social interaction and memory for faces.

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Study Reveals that Ants Perform Amputation Surgeries

(University of Lausanne, July 08, 2024)

Conducted by the University of Lausanne, and led by Dr. Erik Frank, a study reveals that *camponotus floridanus* ants amputate the limbs of their injured peers to save their lives, a behavior unique to this species. Through meticulous laboratory observations, researchers documented this extraordinary behavior and analyzed how ants perceive pain and cooperate without showing signs of suffering. This breakthrough provides deep insights into the evolution of medical practices among non-human species and highlights the complexity of social behaviors in animal populations. Dr. Erik Frank aims to further investigate the implications of this behavior on pain management and the effectiveness of amputations in saving lives.

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Advancing Pediatric Cancer Treatment with Proton Therapy

(Paul Scherrer Institute, July 08, 2024)

The Paul Scherrer Institute, in collaboration with ETH Zürich and EPFL, announces a pioneering initiative to enhance pediatric cancer treatment using proton therapy. Under the leadership of Prof. Dr. Weber Damien Charles and Dr. Alessia Pica from the Centre for Proton Therapy at PSI, this research promises a faster pathway to effective treatment with the aid of artificial intelligence. Proton therapy, a precise form of radiation treatment, targets tumors while sparing surrounding healthy tissue. This is particularly crucial for babies and children, offering a more effective and less invasive treatment option for pediatric cancer patients. The collaboration within the ETH Domain underscores the commitment to leveraging cutting-edge technology and interdisciplinary research to improve health outcomes for the youngest patients.

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Unraveling Amyloid Fibril Formation

(EPFL, July 17, 2024)

Researchers at EPFL, led by Professor Giovanni Dietler and Professor Henning Stahlberg, and Professor Raffaele Mezzenga at ETH Zürich, have made a groundbreaking discovery in understanding the formation of amyloid fibrils. This study provides critical insights into amyloid fibril structures, known as "polymorphs," and the complex process of protofilament intertwining, which has profound implications for diseases like Alzheimer's. The comprehensive research, conducted by an extensive team of scientists at EPFL, revealed the hierarchical intertwining of protofilaments that governs the formation of mixed-curvature amyloid polymorphs. This breakthrough could offer new therapeutic targets for treating amyloid-related diseases and potentials in biotechnology and materials science.

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Even Fish Society Shows Social Control and Nepotism

(University of Bern, July 17, 2024)

A study led by Prof. em. Dr Michael Taborsky and Dr Irene García Ruiz from the University of Bern, has shed light on social behavior and control mechanisms in African cichlid species "Princess of Lake Tanganyika". The research revealed that these cichlids exhibit nepotism, punishing their own offspring less harshly if they fail to "help out." The study took place at the Ethological Station Hasli at the University of Bern. Researchers conducted experiments to manipulate the helpers within the cichlid society, uncovering this intriguing aspect of fish social systems. This breakthrough provides valuable insights into the evolutionary mechanisms underlying animal behavior, enhancing our understanding of social systems.

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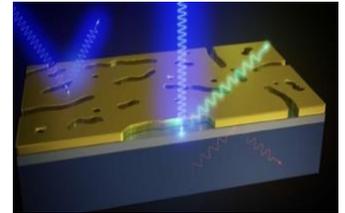
4. Nano / Micro Technology / Material Science

Breakthrough in Surface Characterization Techniques

(ETH Zurich, June 25, 2024)

An interdisciplinary team of materials scientists and electrical engineers led by Dr. Lukas Novotny, Professor of Photonics at ETH Zürich, in collaboration with Humboldt-Universität zu Berlin, has achieved a significant scientific breakthrough. The team developed a method using an extremely thin gold membrane to substantially ease the characterization of surfaces. The innovative gold membrane can enhance the signal strength of surface analysis by up to a thousand times, offering potential customization for specific surfaces in the future. Since surfaces play a critical role in the functionality of various materials like catalysts, solar cells, and batteries, the ability to more easily and accurately characterize surfaces can drive the development and optimization of functional materials, addressing existing challenges in both animate and inanimate nature, and may have substantial impacts across materials science, chemistry, and engineering.

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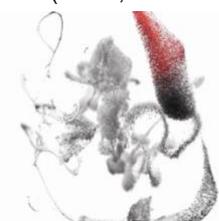
5. Information & Communications Technology

Mapping the Biology of Spinal Cord Injury in Unprecedented Detail

(EPFL, June 20, 2024)

Dr. G. Courtine and EPFL scientists have achieved a significant breakthrough in understanding spinal cord injuries. They have utilized advanced cell and molecular mapping technologies, coupled with artificial intelligence, to create a detailed map of the molecular processes in cells following spinal cord injuries. Their pioneering work, published in Nature as an open-source 'atlas,' identifies key neurons and genes involved in recovery. The research, conducted using rodent models, has led to the proposal of a gene therapy showing promising results. This study is crucial for developing effective, personalized therapies for spinal cord injury patients. Courtine and his team have been making significant advances for over a decade, and the insights gained are expected to have important clinical applications.

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Revolutionizing Animal Behavior Analysis with Foundation Models

(EPFL, June 24, 2024)

Researchers at EPFL, led by Dr. Mackenzie Mathis and Shaokai Ye, have developed an advanced technology called SuperAnimal. This deep learning-based tool can analyze the behavior of various animal species in their natural environments, offering new insights into animal body language, health, and intentions. Building on the previously established DeepLabCut technique, the SuperAnimal model compiles a vast set of observational databases using a harmonized language. This significant improvement enhances the performance of the model and makes analyzing animal movements more accessible. Developed through extensive computational algorithms and pre-training, the technology is poised to transform veterinary medicine, biomedical research, neuroscience, and animal conservation. By improving our understanding of animal behavior, this breakthrough can lead to better animal welfare and scientific advancements.

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AI Reality Lags the Hype in Swiss Tech Industries

(ETH Zurich, June 27, 2024)

ETH Zürich, in collaboration with Swissmem and NEXT INDUSTRIES, recently conducted a survey on the adoption of AI in the Swiss tech industry, garnering participation from over 200 companies. The findings, led by Professor Torbjørn Netland, indicate that AI, particularly in manufacturing, is predominantly in the pilot phase despite its high-profile hype. While the study shows a cautious yet ambitious approach towards AI, it underscores the need for a coherent AI strategy and in-house AI expertise to fully capitalize on its potential. Smaller companies, due to financial constraints, face notable challenges in AI implementation, unlike larger enterprises that show more promising plans for the near future. Despite the sobering results, there is optimism. The ETH survey highlights Swiss tech's international competitiveness, driven by pragmatism and efficiency improvement rather than trend-following. To harness AI's transformative capabilities, companies are advised to formulate a clear AI strategy aligned with their digital transformation goals and invest in AI talent.

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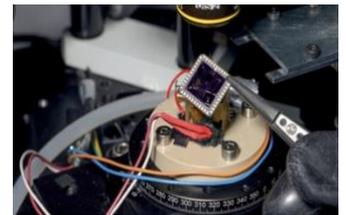


A 2D Device for Quantum Cooling

(EPFL, July 09, 2024)

Engineers at EPFL, led by Professor Andras Kis and Gabriele Pasquale, have achieved a significant breakthrough in the field of quantum cooling. They developed a device capable of efficiently converting heat into electrical voltage at temperatures lower than that of outer space. This remarkable feat was accomplished by merging the excellent electrical conductivity of graphene with the semiconductor properties of indium selenide, resulting in a two-dimensional device. The device utilizes the Nernst effect to generate electrical voltage when a magnetic field is applied to an object with a varying temperature. This innovation is crucial as it could revolutionize cooling systems for future technologies, especially quantum computing, by integrating seamlessly into existing low-temperature quantum circuits.

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How AI Tackles Complex Data Sampling

(EPFL, July 15, 2024)

A team of scientists led by Prof. Dr. Florent Krzakala and Prof. Dr. Lenka Zdeborova at EPFL have made a significant breakthrough in understanding the performance of neural network-based generative models compared to traditional data sampling techniques. This study focuses on a specific class of probability distributions related to spin glass materials and statistical inference problems. The research drew inspiration from the intricate world of spin glasses to analyze modern data generation techniques, shedding light on how neural network-based models navigate complex data landscapes. The study found that diffusion-based methods might face challenges due to a first-order phase transition, thereby revealing the efficiency and limitations of modern generative models. This breakthrough is a crucial step towards enhancing our theoretical understanding of generative models.

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6. Energy / Environment

New Predictive Model for Alpine Mass Movements

ETH Zürich Professor of Alpine Mass Movements Johan Gaume and his team have made a significant breakthrough in predicting alpine mass movements and process cascades. Their innovative research has developed computer models that can accurately simulate complex natural phenomena such as snow, ice, rock, and debris flows, as well as cascading events like rock-ice avalanches. These advanced models enhance our understanding and prediction of natural disasters in the Alps, and the ongoing research will include additional simulations to refine and improve the model's accuracy. This advancement holds enormous potential for saving lives and protecting property in regions vulnerable to mass movements, making it a crucial development in disaster management and prevention.

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(ETH Zurich, June 03, 2024)



Scientists Map Biodiversity Changes in the World's Forests

Scientists at EPFL and ETH Zürich, under the leadership of Prof. Dr. Devis Tuia, have achieved a remarkable milestone by mapping biodiversity in forests worldwide. This pioneering study merges forest biodiversity data with climate projections, unveiling trends crucial for supporting ecosystem conservation and restoration. The research provided a global overview of forest biodiversity, extending beyond well-documented regions. Insights from this study are vital for policymakers and planners, guiding sustainable forest management practices. Astonishingly, the study reveals that 31% of tree species are threatened with extinction, emphasizing the urgent need to fortify forest ecosystems' resilience. The scale and breadth of species analyzed in this research will help prioritize regions for protection and identify the most resilient tree species to local climate impacts.

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(EPFL, June 03, 2024)



Study Confirms Decline in Ozone-Depleting Chemicals

Researchers from the University of Bristol and Empa have achieved a significant milestone in environmental science, as published in Nature Climate Change. This international team has confirmed the success of historic regulations in reducing atmospheric levels of harmful chemicals that destroy the Earth's protective ozone layer. The research, conducted with high-precision measurements at globally distributed atmospheric observatories, includes critical data from the high-alpine research station at Jungfraujoch in Switzerland, where Empa scientists led the atmospheric measurements. This study underscores the importance of continued vigilance and proactive environmental monitoring to ensure other controlled ozone-depleting and greenhouse gases follow a similar declining trend, safeguarding our planet for future generations.

[/web/2024/06-240612-a2](#)

(EMPA, June 12, 2024)





Electrifying Industry with Flexible Heat Pumps

(ETH Zurich, June 14, 2024)

Researchers from ETH Zürich and the Eastern Switzerland University of Applied Sciences, led by Professor Stefan Bertsch, have developed an innovative solution for heat pumps. Their groundbreaking discovery involves a mixture of two components that can boost heat pump efficiency by up to 25%, with the added potential to generate carbon-free process heat at temperatures reaching up to 200 degrees Celsius. Through rigorous testing, the researchers demonstrated this enhanced efficiency and are now collaborating with heat pump manufacturers and industry partners to further develop and implement the technology.

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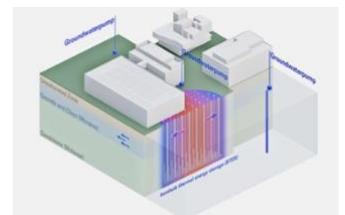


Impact of High-temperature Heat Storage on Groundwater

(EMPA, June 14, 2024)

Researchers led by Joaquín Jiménez-Martínez from Eawag, in collaboration with Empa, have embarked on a pioneering project. Jointly supported by the Swiss Federal Office of Energy SFOE and the Cantons of Zurich, Aargau, Thurgau, Zug, and Geneva, this research focuses on understanding the reactions triggered by heat storage in groundwater. The team aims to uncover how heat affects groundwater, potentially contributing to the decarbonization of local energy systems. Utilizing advanced tools like the GE-MIMS mass spectrometer and DNA tracing, the researchers are drilling new holes to extract groundwater samples. These samples are then analyzed for changes in microbial diversity and chemical composition.

[/web/2024/06-240614-ca](#)



Paradigm shift in energy planning

(EMPA, June 19, 2024)

Empa researcher Dr. Matthias Sulzer and Berkeley Lab researcher Dr. Michael Wetter are proposing a revolutionary shift in energy systems planning. Inspired by the platform-based design used in the computer chip industry, their suggested automated and model-based planning process aims to address the intricate requirements of future building and energy systems. Their research explores the newly established thermal energy storage field at the Empa campus in Dübendorf. As part of the EU GOES project and the ARTS project, this pilot plant examines the effects of borehole thermal energy storage on soil, groundwater, and microorganisms.

[/web/2024/06-240619-3c](#)



Synhelion Inaugurates First Facility for Renewable Fuel Synthesis

(RTS Info, June 24, 2024)

Swiss startup Synhelion, launched its first-ever facility that incorporates all processes necessary for the thermochemical synthesis of renewable fuel. The new center, named "DAWN," aims to orchestrate the beginning of a new era in aviation fuel history, replacing fossil kerosene with synthetic fuels. This venture is led by the founders, Dr. Philipp Furler and Dr. Gianluca Ambrosetti, who remain grounded in their conviction that this is only the beginning. Central to Synhelion's technology, is the company's capacity to harness solar radiation at very high temperatures. When temperatures exceed 1000 degrees, the recombination of hydrogen, oxygen, and carbon atoms can occur. By injecting biomethane, water, and CO₂, the result is oxygen and synthetic gas (syngas) which can be refined into various types of fuel, including diesel or kerosene.

[/web/2024/06-240624-6c](#)





Revolutionary Path to Carbon-Free Ammonia Production

(ETH Zurich, July 03, 2024)

A collaborative research team led by Professor Giovanni Sansavini from ETH Zürich, together with lead author Dr. Stefano Mingolla, has achieved a groundbreaking advancement in the production of green hydrogen for ammonia synthesis. This development is poised to significantly reduce carbon emissions in industrial ammonia production processes. The study underscores the efficient and impactful use of green hydrogen, highlighting the need for sustained investment in R&D and economic incentives to make green hydrogen competitive throughout Europe. The team suggests maintaining a residual proportion of fossil energy in green hydrogen for practical ammonia production, while also recommending a dual approach where wind or solar farms and agricultural use coexist.

</web/2024/06-240703-a8>



Advancing Biodiversity Monitoring with Innovative Technologies

(University of Zurich, July 10, 2024)

The URPP Global Change and Biodiversity research initiative at the University of Zurich is making strides in understanding and preserving biodiversity. This comprehensive effort has not only unveiled new insights into the importance of biodiversity but also developed cutting-edge technologies for its monitoring. Their research methodology is interdisciplinary, encompassing contributions from social sciences and humanities to explore ethical considerations of biodiversity. By establishing a robust network of junior researchers and engaging with national and international committees, the initiative has raised significant awareness about the biodiversity crisis.

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Transforming River Monitoring with Low-Cost Sediment Sensors

(ETH Zurich, July 11, 2024)

Jessica Droujko, a doctoral student at ETH Zürich, supervised by Professor Peter Molnar, has pioneered an innovative, open-source, low-cost turbidity sensor for river network monitoring. This groundbreaking development enables real-time data collection on river water quality, promoting informed decisions for sustainable land use and conservation practices. Conducted through the deployment of this sensor, Droujko's research has provided a powerful tool for accessible and affordable water quality monitoring, which was published in Scientific Reports in June 2022. Supported by the Student Project House at ETH Zürich, she developed her first sensor and encourages other doctoral students to explore entrepreneurship, turning their research into marketable innovations.

</web/2024/06-240711-1d>



Climate Change Impact on Alpine Vegetation

(WSL, July 11, 2024)

Researchers from WSL and the Swiss Data Science Center (SDSC), led by Michael Zehnder, have made a breakthrough in studying the effects of climate change on alpine vegetation growth. Using machine learning algorithms, Zehnder, in collaboration with Jan Svoboda from SDSC, analyzed data from the Intercantonal Measuring and Information System (IMIS) weather stations. This innovative approach allows for more precise and efficient measurement of the height and growth of alpine vegetation, which is essential for understanding the broader impacts of climate change on mountain ecosystems.

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How Climate Change is Altering the Earth's Rotation

(ETH Zurich, July 18, 2024)

In a study conducted by ETH Zürich, lead researcher Mostafa Kiani Shahvandi, Assistant Professor Benedikt Soja, and Assistant Professor Siddhartha Mishra, have provided a comprehensive explanation of long-period polar motion, emphasizing the interconnected processes on and within the Earth. Utilizing physics-informed neural networks — a novel AI method that incorporates the principles of physics to create reliable machine learning algorithms — the researchers unveiled that climate change is not only affecting the Earth's axis of rotation but also influencing the dynamics of the Earth's core. This discovery signifies a deeper understanding of how climate change impacts Earth's processes, extending well beyond surface phenomena.

[/web/2024/06-240718-14](#)



Cost-Effective Emission Reduction from Cement Paste Recycling

(EMPA, July 19, 2024)

Experts at Imperial College London, led by Dr. Rupert J. Myers in collaboration with scientists from Empa and EPFL, have uncovered a groundbreaking method for reducing emissions from cement production. Their study highlights the recycling of demolished concrete through CO₂ mineralization as a cost-effective solution. The research involved examining company claims and assessing the effectiveness of waste cement paste in emissions reduction. The team emphasized the urgent need for policies that support these recycling technologies to maximize environmental benefits. This crucial study represents a significant step in combating climate change by targeting emissions from the construction industry and cement production. Moreover, it underscores the necessity for further research to reduce costs and enhance carbon capture and utilization technologies.

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Insights into Deepwater Renewal in Lake Geneva

(EPFL, July 19, 2024)

Researchers at EPFL have redefined our understanding of deepwater renewal in Lake Geneva. The team discovered that strong currents from the lake's Petit Lac basin and nearshore zones of the Grand Lac significantly contribute to this process, challenging the traditional belief that vertical mixing was the primary driver. By employing advanced scientific methods and analysis to study the winter hydrodynamics, the EPFL team highlighted the complex, three-dimensional mixing processes at play. This finding is crucial as it offers new insights into the health and sustainability of Lake Geneva and underscores the importance of its two-basin structure in the renewal process. These insights could also be valuable for understanding similar processes in other temperate lakes.

[/web/2024/06-240719-f5](#)



7. Engineering / Robotics / Space

Solving the Mystery of Cathodic Corrosion Protection

(ETH Zurich, June 06, 2024)

Researchers at ETH Zürich, led by Dr. Federico Martinelli-Orlando, have made significant strides in understanding the underlying mechanisms of cathodic corrosion protection. The team demonstrated that the formation of a thin metal oxide film on steel surfaces results from an increase in pH due to electrochemical processes, providing a comprehensive explanation that resolves previous conflicting hypotheses. The study developed a mechanistic model that accounts for all electrochemical processes, examining the interface between steel and the electrolyte to characterize spatial and temporal changes.

</web/2024/07-240606-25>



ANDES, the Spectrograph in a Quest for Life in the Universe

(University of Geneva, June 06, 2024)

Scientists at the Life in the Universe research Center, University of Geneva, led by Prof. Dr. Christophe Lovis, Dr. Audrey Lanotte, and Prof. Dr. Christoph Mordasini, have developed the ANDES spectrograph in collaboration with the University of Bern. This groundbreaking instrument is set to revolutionize the study of exoplanet atmospheres and the search for biosignatures, opening new frontiers in our quest to understand the potential for life beyond Earth. The research involves the creation of a high-precision tool specifically designed to observe exoplanets, with an emphasis on detecting the faint signals of exo-Earths. With contributions from a dozen specialists at the University of Geneva, Switzerland is emerging as a global leader in this domain.

</web/2024/07-240606-6b>



First Ever Detection of Frost on Mars' Tallest Volcanoes

(University of Bern, June 12, 2024)

Researchers from the University of Bern, led by Prof. Dr. Nicolas Thomas and Dr. Adomas Valantinas, have achieved a groundbreaking discovery in planetary sciences. They have successfully detected frost on the Solar System's tallest volcanoes on Mars. This research leveraged a variety of instruments and modeling techniques to enhance our understanding of the interactions between the Martian atmosphere and its surface. This breakthrough holds significant importance for future Mars missions as it provides critical insights into the planet's climate and the movement of water between different reservoirs.

</web/2024/07-240612-4a>



Breakthrough in Biomimetic Membrane Technology

(University of Fribourg, June 12, 2024)

A team led by Professor MAYER Michael at University of Fribourg, has achieved a remarkable advancement in biomimetic membrane technology. Collaborating with the Technische Universität Darmstadt, the University of Paris-Saclay, and EPFL, their research reveals membranes that could replicate the performance of biological electric organs, such as those found in electric rays. Conducted by AMI's Biophysics Group, this groundbreaking research demonstrates that these membranes can be scaled to larger surfaces and integrated into stacked systems. This scalability offers unprecedented capabilities in transporting rates for separation, production, and energy storage processes.

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Edible Robots and Robotic Food

A team of scientists from EPFL, IIT, and the University of Bristol, led by Professor Dario Floreano and with lead author Bokeon Kwak, have developed edible robots and robotic food. Their remarkable research includes creating edible components such as actuators, sensors, and even rechargeable batteries made from riboflavin, quercetin, and nori algae. The team also invented a conductive ink that can be sprayed on food to detect its maturity and a gelatin-based gripper capable of manipulating food. This research aims to reduce electronic and toxic waste while offering novel gastronomic experiences.

[/web/2024/07-240617-c8](#)

(EPFL, June 17, 2024)



High-precision Measurements Challenge the Understanding of Cepheid Stars

Researchers led by Richard I. Anderson from EPFL, in collaboration with the University of Geneva, KU Leuven, and other institutions, have achieved a groundbreaking understanding of Cepheid stars. Through the VELOCE project, Anderson and his team have challenged existing theories, providing new insights into the evolution and physics of these pivotal stars. Their high-precision measurements, gathered using the Swiss Euler telescope in Chile and the Flemish Mercator telescope on La Palma, are crucial for understanding the nature of stars and their evolution. This research also provides essential data for determining distances and the expansion rate of the universe.

[/web/2024/07-240617-1f](#)

(EPFL, June 17, 2024)



Breakthrough in Metabolic Health Research

Scientists at EPFL, led by Dr. Johan Auwerx, have developed a metabolic health score (MHS) by using clinical parameters and leveraging a genetically diverse population of mice called "BXD." This groundbreaking study aims to unravel the genetic foundations of metabolic health and validate these insights using human data. In their research, 49 different strains of BXD mice were fed either a standard diet or a high-fat diet, and key health indicators were meticulously measured. The study identified TNKS and MCPH1 as pivotal regulators of metabolic health, emphasizing the significant role of genetics. This research not only provides a robust model for studying gene-environment interactions but also opens new doors for understanding and mitigating metabolic diseases.

[/web/2024/07-240619-d7](#)

(EPFL, June 19, 2024)



Breakthrough in Object Manipulation Using Soundwaves

Led by Prof. Dr. Romain Fleury from EPFL, Prof. Dr. Bakhtiyar Orazbayev, and Dr. Matthieu Molléjac, groundbreaking research has emerged in manipulating objects using soundwaves. This innovative research was conducted in collaboration with the University of Bordeaux, Nazarbayev University, and the Technische Universität Wien. The team conducted experiments involving an array of speakers emitting audible sound waves to direct a floating ping-pong ball along a pre-determined path in a large tank of water. Feedback from a second array of microphones allowed real-time calculations to optimize the sound waves' momentum, enabling precise control. This technique has significant potential applications, including targeted drug delivery, biological analysis, tissue engineering, and 3D printing.

[/web/2024/07-240625-3a](#)

(EPFL, June 25, 2024)





New Insights into Sub-Neptune Densities

(University of Geneva, June 27, 2024)

Researchers from the University of Geneva and the University of Bern, led by Dr. Adrien Leleu, have made a noteworthy discovery in the realm of planetary science. Their study, published in *Astronomy & Astrophysics*, uncovers the underlying reasons for the density differences among sub-Neptune planets. Through advanced numerical models developed over the last two decades at the University of Bern, they found that the formation and evolution of planetary systems produce two distinct populations of sub-Neptunes: dense and less dense. Interestingly, planets in resonance were discovered to be less dense. Their research also confirmed that giant collisions, on par or more intense than the one that formed our Moon are common in most planetary systems.

[/web/2024/07-240627-be](#)



New Class of Mars Quakes Reveals Daily Meteorite Strikes

(ETH Zurich, July 01, 2024)

An international team, including scientists from ETH Zürich and NASA's Mars InSight Mission, led by Professor Domenico Giardini, has uncovered a new class of Mars quakes. This breakthrough reveals that near-daily meteorite strikes on the surface of Mars can be identified using seismic data. By analyzing seismic signals, the researchers estimated a global meteorite impact rate, discovering that basketball-sized meteoroids impact Mars much more frequently than previously thought. These impact-generated seismic signals demonstrated that meteorite strikes are five times more abundant than earlier estimates. By calculating crater diameters from the magnitude of these VF-marsquakes and their distances, the team provided crucial insights into Mars' crater density and the age of various regions.

[/web/2024/07-240701-6e](#)



Ultra-Miniaturized Atomic Clock for Lunar Time

(RTS Info, July 02, 2024)

Researchers at the University of Neuchâtel have achieved a new milestone in the development of ultra-miniaturized atomic clocks designed to determine coordinated lunar time. This innovation marks a significant step forward in the space exploration and lunar missions. This atomic clock allows for unparalleled precision in coordination, communication, and geolocation on the lunar surface. By ensuring accurate lunar time, this technology is set to play a crucial role in the success of future space missions, facilitating better navigation and operational efficiency for astronauts and space agencies alike.

[/web/2024/07-240702-c8](#)



A Collaboration to Push the Boundaries of Cosmos Mapping

(EPFL, July 03, 2024)

EPFL partners with Tsinghua University to collaborate on the MUST (Multi Spectroscopic Telescope) project, an initiative that aims to create a comprehensive mapping of the cosmos, enhancing our understanding of the young universe, dark energy, and dark matter. Through this partnership, EPFL gains access to next-generation spectroscopic surveys, potentially uncovering hundreds of millions of distant galaxies. This endeavor will also involve developing theoretical models to interpret the vast incoming data. The open-source nature of the project ensures wide access to its software and hardware innovations, and EPFL's data science expertise positions it to make significant contributions.

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8. Physics / Chemistry / Math

Miniaturizing a Laser on a Photonic Chip

(EPFL, June 14, 2024)

Scientists at EPFL, led by Dr. Yang Liu, have achieved a significant breakthrough by miniaturizing a powerful erbium-based fiber laser onto a silicon-nitride photonic chip. This innovation is poised to transform the fields of optical communications and sensing technologies by overcoming the traditional size limitations of these lasers. The research team designed a meter-scale laser cavity within a compact chip by integrating microring resonators, which extend the optical path without increasing the physical size. They implanted the circuit with high-concentration erbium ions to help make the laser stronger. Then, they used a particular type of laser called a III-V semiconductor pump laser to create the laser beam. Additionally, they developed an intra-cavity design employing microring-based Vernier filters, enabling dynamic wavelength tuning over a broad range. This advancement paves the way for improved optical communications, more precise sensing technologies, and broader industrial applications.

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New Technique for Quantum State Manipulation

(ETH Zurich, June 21, 2024)

ETH Zürich researchers, led by Dr. Stepan Kovarik, have achieved a remarkable scientific breakthrough by uncovering a novel way to manipulate quantum states. They have successfully induced electron paramagnetic resonance (EPR) in single molecules, shedding light on a process that was previously unclear. Conducted using a scanning tunneling microscope to meticulously characterize electron clouds in molecules, this research involved experiments with pentacene molecules on a silver substrate. This advancement is crucial as it enhances our understanding of quantum mechanical processes. Moreover, it has the potential to significantly impact various fields such as materials research, chemistry, and biophysics.

</web/2024/08-240621-2d>



Atom-thin Graphene Membranes for Efficient CO2 Capture

(EPFL, June 24, 2024)

Scientists at EPFL, led by Prof. Dr. Kumar Varoon Agrawal, have developed advanced atom-thin graphene membranes with pyridinic-nitrogen at pore edges. This groundbreaking innovation has demonstrated exceptional performance in CO₂ capture, marking a significant leap forward in the field of carbon capture technologies. Conducted in collaboration with the EPFL Laboratory of Materials for Renewable Energy and funded by EPFL, Gaznat AG, the Swiss National Science Foundation SNSF, the European Research Council (ERC), and the EPFL-Taiwan PhD Scholarship program, this research is set to transform industrial emissions management. The team is now focused on scaling production with a continuous roll-to-roll process. Given the urgent need for efficient, cost-effective carbon capture solutions to combat climate change, these versatile and efficient membranes hold promise for drastically reducing industrial carbon emissions.

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Geological Archives Predict our Climate Future

(University of Geneva, June 26, 2024)

Researchers from the University of Geneva, led by Marine Prieur and Professor Sébastien Castellort, have made significant strides in understanding the effects of global warming on soil erosion. Their study focused on increased rainfall during storm events and its role in river flooding and sediment transport from the Pyrenees mountains to the oceans. The team analyzed *Microcodium* grains — specific types of sediment collected in the Pyrenees — to investigate these phenomena. Their findings highlight the significant impact of global warming on soil erosion, and provide crucial insights for predicting future climate risks, such as flooding and soil collapse in populated areas.



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Advancing Real-Time Analysis in CO2 Electrolysis

(EMPA, June 28, 2024)

A groundbreaking collaboration between Empa, Paul Scherrer Institut, and ETH Zürich, led by Prof. Dr. Corsin Battaglia, has resulted in a significant scientific achievement. Their joint project, PREMISE, has successfully developed the world's first online liquid chromatography device for identifying and quantifying liquid reaction products in real-time during CO₂ electrolysis. The research involved creating an advanced software solution to analyze massive datasets and make them openly accessible to scientists worldwide. A key aspect of the PREMISE project is fostering open access to research data and developing a novel parallel CO₂ electrolysis system, thus sharing both data and expertise with other Swiss research institutions.



[/web/2024/08-240628-6a](#)

Membrane Protein Analogues Could Accelerate Drug Discovery

(EPFL, July 01, 2024)

A team of EPFL scientists, led by Prof. Dr. Bruno Correia and Casper Goverde, has developed a deep learning pipeline that designs soluble analogues of key protein structures, eliminating the need for expensive extraction processes from cell membranes. Using Google DeepMind's AlphaFold2 for structure prediction, the researchers produced amino acid sequences for soluble versions of key cell membrane proteins. These sequences were then optimized using a second deep learning network, ProteinMPNN, to ensure functionality and solubility. This advance accelerates drug discovery by simplifying access to crucial cell membrane proteins, pivotal for drug and antibody development.



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Controlling Electronics with Light

(EPFL, July 01, 2024)

Researchers at EPFL, Politecnico di Milano, Università degli Studi di Milano-Bicocca, and Université Paris-Saclay, CNRS, led by Dr. Fabrizio Carbone, have achieved a scientific breakthrough in controlling electronics using light. Their discovery reveals that by applying different wavelengths of light to magnetite, its electrical conductivity can be modulated, opening the door for new innovative materials for electronics. The team conducted their research using ultrafast generation of hidden phases via energy-tuned electronic photoexcitation in magnetite, uncovering how specific wavelengths can alter the material's state. This finding is crucial as it can lead to the development of new and advanced electronic devices, potentially transforming the field of electronics by enabling more efficient and adaptable materials.



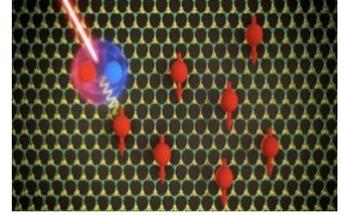
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New Method for Determining the Exchange Energy of 2D Materials

(University of Basel, July 15, 2024)

Researchers from the University of Basel, led by Prof. Dr. Richard Warburton and main author Dr. Nadine Leisgang from Harvard University, have made a groundbreaking discovery in the field of 2D materials. The team has precisely determined the exchange energy of molybdenum disulfide when surrounded by hexagonal boron nitride and graphene, a significant step in understanding the stability of ferromagnetism in these materials. By exciting molybdenum disulfide with a laser and analyzing the emitted spectral lines, the researchers measured the energy required to flip an individual electron spin within the ferromagnetic state. This new understanding is crucial for advancing the electrical and optical properties of 2D materials, with broad implications for future technologies in electronics and optoelectronics. Their work also included the formation of van der Waals heterostructures, further exploring the unique properties of these materials.



[/web/2024/08-240715-bb](#)

10. Economy, Social Sciences & Humanities

6,000 Years Ago, Men and Women Had Equal Access to Resources

(University of Geneva, June 14, 2024)

New research from the University of Geneva led by doctoral student Déborah Rosselet has revealed equal access to resources between men and women 6,000 years ago. This significant discovery sheds light on gender dynamics in ancient societies and challenges previous assumptions about gender inequality in prehistoric times. Utilizing a multidisciplinary approach, the team conducted an in-depth analysis incorporating genetics, paleopathology, dental calculus, and morphology. The study spanned various Neolithic sites in Valais and Val d'Aosta in Italy, employing isotopes such as neodymium to provide a comprehensive understanding. This research not only enhances our knowledge of ancient resource distribution but also broadens our perception of social structures throughout human history.



[/web/2024/10-240614-51](#)

Discovery of a Second Shipwreck Near Antikythera

(University of Geneva, July 08, 2024)

Led by Dr. Lorenz Baumer from the University of Geneva, the Swiss School of Archaeology in Greece (ESAG) made an incredible discovery by confirming the presence of a second wooden boat near the famous Antikythera shipwreck, dating back to the 1st century BCE. This exciting find significantly enhances our understanding of ancient maritime history. During an expedition conducted from May 17 to June 20, 2024, the team uncovered a substantial part of the ship's hull in remarkable condition. This discovery not only provides deeper insight into ancient maritime trade but also into navigation techniques during the Antiquity period. Such findings enrich our knowledge of historical seafaring practices and their influence on cultural and economic exchanges across the Mediterranean.



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

Decoding Baby Cries with AI

(Swisstech, June 21, 2024)

Researchers from Hospital Clínic de Barcelona and the Swiss startup Zoundream have introduced a groundbreaking development in neonatal care. Using a deep learning-based solution called AMSI (Acoustic Multi-Stage Interpreter), they have successfully decoded baby cries, offering insights into the needs of newborns. The research involved collecting over 100,000 hours of newborn crying recordings and creating a custom deep learning model to analyze these cries. By classifying the cries based on acoustic, neurophysiological, facial expression, and body movement data, this breakthrough provides crucial evidence for interpreting healthy babies' cries at home and signals clinical potential for assessing newborn health. Zoundream is collaborating with the renowned baby brand Maxi Cosi to make this transformative technology accessible to parents globally, helping them understand if their baby is hungry, sleepy, fussy, irritated, or experiencing gastrointestinal distress.

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Startfeld Shines as Europe's Leading Start-Up Hub

(EMPA, July 07, 2024)

Empa proudly announces that Startfeld has been recognized as one of Europe's premier startup hubs for 2024. Situated in St. Gallen, Startfeld is a vital cornerstone of the region's startup ecosystem and a key partner of the Switzerland Innovation Park Ost. In collaboration with the University of St. Gallen and START Global, Startfeld established the HSG START Accelerator, broadening the horizons of startups and enriching the entrepreneurial landscape in the Canton of St. Gallen with a global perspective. Startfeld has supported over 175 projects and numerous Empa spin-offs, including Swisstest Testmaterialien AG, Ugra, Nahtlos AG, MycoSolutions, and Ionic Wind Technologies. Recently, Startfeld received the Financial Times Award for its support to Empa spin-offs.

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PSI and Copenhagen Atomics Join Forces for Advanced Reactor Research

(Paul Scherrer Institute, July 09, 2024)

The Paul Scherrer Institut, has announced a collaboration agreement with Copenhagen Atomics. Over the next four years, this partnership aims to push Europe to the forefront of advanced reactor concepts and nuclear energy research. Leveraging PSI's unique Hot Laboratory and their expertise in nuclear safety, future reactor concepts, related fuel cycles, and nuclear waste treatment, this collaboration promises significant scientific advancements. Copenhagen Atomics, known for their specialization in advanced reactor technologies, will add substantial value to the project. This research is crucial as it not only enhances nuclear energy safety but also contributes to positioning Europe as a global leader in advanced reactor development.

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Revolutionary Battery Design Reduces Environmental Impact

(ETH Zurich, July 16, 2024)

Scientists at ETH Zürich in Dr Maria Lukatskaya's research group, including Dr Nathan Hong, have made a pivotal advancement in battery technology. The team's innovative method leverages electrostatic attraction to achieve a desired reaction in battery design, significantly reducing its environmental footprint. Utilizing electrically charged fluorinated molecules, the process efficiently transports fluorine to a protective layer, cutting down the necessary fluorine in the liquid electrolyte by at least 20 times compared to previous studies. This research promises to make batteries greener and more sustainable, and the team also established a robust method for constructing battery interphases from dilute fluorinated cations.

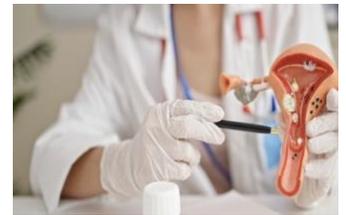


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A Hydrogel Implant to Treat Endometriosis

(ETH Zurich, July 18, 2024)

In a multidisciplinary collaboration, researchers from ETH Zürich and Empa, led by Dr Alexandre H. C. Anthis and Professor Inge K Herrmann at ETH Zürich, have designed a hydrogel implant for use in fallopian tubes, which serves a dual purpose as a contraceptive and a preventative measure against endometriosis. The research involved ex-vivo experiments on human and animal fallopian tubes, and in vivo tests in a live pig to assess the implant's stability and compatibility. The results were promising: the implant is not perceived as a foreign body, and it can be easily destroyed with UV light or a special solution if required.



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How Satellite Images Help to Protect Forests

(ETH Zurich, July 19, 2024)

Professor Benedikt Soja from ETH Zürich, in collaboration with askEarth, has developed a software to protect forests. This breakthrough leverages satellite images to analyze forestry data and assess deforestation risks, enhancing sustainability efforts in the timber industry. Conducted alongside the European Space Agency and the European Commission's Copernicus Programme, which provides freely accessible satellite data, this research integrates advanced software into enterprise resource planning (ERP) systems. This allows companies in industries like timber, soy, cocoa, coffee, rubber, palm oil, and cattle to receive immediate, objective information on deforestation and forest damage.



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12. General Interest

ETH Zurich Again in 7th Place

(ETH Zurich, June 05, 2024)

ETH Zürich has been ranked seventh in the latest global university rankings for 2025, and leading in Earth & Marine Sciences, Geology, and Geophysics, and a total of 20 subjects in the top-10. Swiss higher education has been ranked third globally, only behind the US and the UK, according to the latest QS World University Rankings for 2025. ETH Zürich's consistent performance underscores its stellar academic reputation, international outlook, and effective sustainability measures.



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Why Some People with the Flu May Be More Contagious

(EPFL, June 27, 2024)

EPFL scientists, led by Dr. Shannon David, have made a groundbreaking discovery about the relationship between viruses and bacteria in the human body. Their study revealed that droplets containing the flu virus remain infectious for a longer duration in indoor spaces when they contain specific bacteria found in the respiratory tract. The research was conducted by collecting data on the bacteria present in the respiratory tract and examining their impact on the infectiousness of the flu virus in indoor environments. The study emphasizes the importance of considering the protective function of bacteria in models predicting virus spread in enclosed spaces. These findings could help researchers identify individuals with higher infectious viral loads, advancing public health research and disease prevention strategies.

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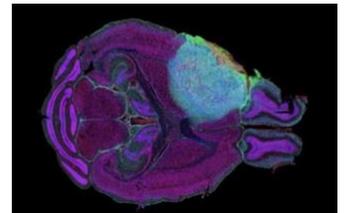


Transformative Insights into Brain Tumor Therapy

(University of Lausanne, July 10, 2024)

Professor Johanna Joyce at the University of Lausanne has led a study on the spatial biology of brain tumor microenvironments. Leveraging a novel hyper-multiplex workflow with ZEISS Axioscan, the research team achieved high-throughput imaging of fragile tissues, using 40-50 markers across extensive regions at high magnifications. Dr. Spencer Watson, a research fellow in Professor Joyce's lab, and his team examined two brain tumor models in response to radiotherapy. Their findings revealed distinct reactions: the brain metastasis model halted cancer cell proliferation, whereas the glioma model underwent significant reduction in size and cellular reorganization, forming a spatial superstructure with hypertrophic tumor cells encircled by fibrosis and tumor-associated immune cells. This research offers vital understanding of tumor microenvironment dynamics, aiding in the development of improved cancer treatments.

[/web/2024/12-240710-c5](#)



Study of Climate Impact in Greenland aboard the Sailboat Forel

(University of Lausanne, July 12, 2024)

As part of the GreenFjord project, funded by the Swiss Polar Institute, Prof. Dr. Samuel Jaccard from the University of Lausanne and five other scientists are embarking on a sampling and analysis campaign in southwest Greenland. Aboard the sailboat Forel, a scientific platform equipped for polar environments, they will examine the impact of climate change in this region. Using various sensors and specialized laboratories, including an ultra-filtered clean room, the scientists are able to make precise observations of oceanic and atmospheric characteristics. Prof. Dr. Samuel Jaccard will focus on analyzing the concentrations of metals essential to biological productivity. Their research highlights the changes in the biological pump caused by glacier melt, directly affecting the carbon cycle and local fishing resources.

[/web/2024/12-240712-79](#)





13. Calls for Grants/Awards

Borobotics Wins Grand Prize at venture Competition

Swiss start-up Borobotics GmbH has recently claimed the Grand Prize worth CHF 150,000 at the venture competition, standing out amongst a strong field of 19 participants. Held at ETH Zürich's Audimax, the event showcased the rise of start-ups tackling critical challenges with innovative solutions. Borobotics GmbH have introduced a ground-breaking drilling robot that revolutionizes geothermal energy drilling, especially pertinent for space-restricted environments like city centres. Departing from the bulky, ten-tonne traditional drilling machinery, their compact robot, named Grabowski, requires just a

(Startupticker.ch, June 20, 2024)



6–8 square metre area, accommodating even small gardens, underground car parks, and basements.

[/web/2024/13-240620-59](#)

Upcoming Science and Technology Related Events

ESMO Academy

August 16-18, 2024

<https://is.gd/E9WNMZ>

Life Sciences, Health Care & Medical
University of Zurich

Biointerfaces International Conference

August 20-23, 2024

<https://biointerfaces.ch/>

Life Sciences, Health Care & Medical,
Pharmaceutical & Biotechnology
FHNW Campus, MuttENZ

Peptide Therapeutics Forum

August 22-23, 2024

<https://ptf24.scg.ch/>

Industrial Products & Engineering,
Pharmaceutical & Biotechnology
Biozentrum, University of Basel

Sustainable Switzerland Forum

August 22-23, 2024

<https://is.gd/W8fqfO>

Business & Economy
Kursaal, Bern

World Summit in Competency-Based Education in Healthcare Professions

August 22-23, 2024

<https://cbme-world-summit.org/>

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

AMEE Conference

August 24-28, 2024

<https://amee.org/amee-2024/>

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

Swiss Battery Days

August 26-28, 2024

<https://is.gd/p8BzZB>

Electronics & Electrical Goods
ETH Zurich

AMLD Generative AI Conference

August 28-29, 2024

<https://is.gd/GVmRiR>

IT, Web & Electronic
SwissTech Convention Center, Lausanne

Top 100 Swiss Startup Award 2024

September 4, 2024

<https://www.top100startups.swiss/award2024>

Startups
Venue to be announced

Swiss-Japan Energy Days 2024

September 10-11, 2024

<https://is.gd/wYmUOf>

Business & Economy, Energy & Sustainability
ETH Zurich

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