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Science-Switzerland, December 2023 – January 2024

News on Swiss science, technology, education and innovation

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A Joint Initiative for Trustworthy AI

(EPFL, December 05, 2023)

ETH Zürich and EPFL have sprung into action with the forward-thinking project "Swiss AI Initiative." Helmed by Vice President for Research of ETH Zurich, Christian Wolfrum, this collaborative endeavor rallies together 12 universities, specialized schools, and research institutions to cultivate and disseminate AI knowledge. The project leapfrogs forward, engaging over 75 professors nationwide, and invites internationals to collaborate on open-source Large Language Models (LLMs). Exclusively, the initiative gets to first utilize 10 million GPU hours powered by the groundbreaking NVIDIA Grace Hopper Superchip on the upcoming supercomputer, Alps. The goal is to formulate LLMs that can be trusted, transparent, compliant with legal, ethical, and scientific standards, and uncomplicated to interpret. Essentially, Swiss AI triggers a paradigm shift, keeping Switzerland in the technological forefront while safeguarding research independence and digital sovereignty.
/web/2023/05-231205-95

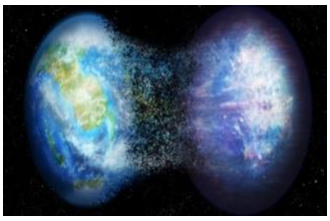
New Approach to Cancer Diagnosis Using AI

(Paul Scherrer Institute, December 15, 2023)

The Paul Scherrer Institute (PSI) has witnessed a significant medical breakthrough. Led by Prof. Dr. G.V. Shivashankar, the team has developed an innovative test that could potentially revolutionize early cancer diagnosis. This test centers on identifying changes in the cell nucleus organization of certain blood cells, which is a key indicator of cancer presence. For this pioneering development, researchers utilized artificial intelligence with blood samples collected from 150 patients at PSI's Centre for Proton Therapy. The test was applied to patients with gliomas, meningiomas, and head and neck tumors. This breakthrough, detailed in their publication "Imaging and AI based chromatin biomarkers for cancer diagnosis and therapy evaluation from liquid biopsies," promises to greatly enhance not just early cancer diagnosis, but also allow for improved monitoring of treatment success.
/web/2023/05-231215-d1

It Takes Nothing to Switch from Habitable to Hell

(University of Geneva, December 20, 2023)



Pioneering research conducted at the University of Geneva is probing into the determinants of hospitability in exoplanets. This study primarily explores how slight alterations in solar radiation could shift a habitable environment into an inhospitable state—an attempt to understand possible runaway processes analogous to what Earth could undergo. In their research, effort is placed on exploring the implication of greenhouse gases in triggering a runaway process. Here, they seek to comprehend if there's a common threshold with temperature increases due to solar luminosity perturbation. This represents a crucial stride in understanding the potential for Earth to transition into an inhospitable condition akin to Venus.
/web/2023/07-231220-d4

1. Policy

Digital Emblem for Humanitarian Law in Cyberspace

(ETH Zurich, December 01, 2023)

Dr. Felix Linker and Dr. David Basin, from ETH Zurich and the University of Zurich, have made a remarkable accomplishment in cybersecurity. They have come up with an innovative solution named Authentic Digital Emblem (ADEM) to ward off cyber threats targeting our digital infrastructures. ADEM's strength lies in its unique cryptographic security using digital signatures, decentralization, and machine-readability. This groundbreaking tool is not only easy to integrate into existing systems but also cost-effective, bridging linguistic, cultural, and tech gaps effortlessly. Particularly noteworthy is its flexibility, permitting the International Committee of the Red Cross (ICRC) staff to disguise the emblem under specific circumstances.
/web/2023/01-231201-4d

Advancements & Regulations in AI Under Research at The University of Zurich

(University of Zurich, December 15, 2023)

Prof. Florent Thouvenin, head of the UZH Center for Information Technology, Society and Law (ITSL) at the University of Zurich's Digital Society Initiative (DSI), recently drove a comprehensive position paper that scrutinizes the opportunities, risks, and regulatory perspectives of AI technology. Their analysis delves deep into how legal frameworks worldwide are reacting to AI development. Notably, Prof. Thouvenin posits the critical need for AI regulation to maximize opportunities while curtailing potential risks. The study illuminates key strategies for countries such as Switzerland, advising them on positioning themselves versus the EU and US in this technological revolution. Notably, the report identifies EU as leading the way in robust AI regulation.
/web/2023/01-231215-26

Dramatic Rise in Antibiotic Use in First Year of Pandemic in Primary Care

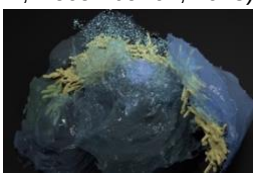
(University of Basel, December 21, 2023)

A concerning escalation in antibiotic usage during the initial phase of the pandemic has been discovered by a dedicated team of scientists led by Professor Heiner C. Bucher from the Department of Clinical Research at the University of Basel and University Children's Hospital of Basel (UKBB). This alarming increase could potentially heighten the risk of bacterial resistance to these lifesaving drugs. By assessing anonymous patient data provided by over two million health insurance policyholders of all ages, and cross-referencing this information with physician billing data, researchers noted a significant uptick across all antibiotic classes. This trend was consistent even among antibiotics not primarily intended for respiratory infections.
/web/2023/01-231221-d3

3. Life Science

Unravelling the Mechanics of Tuberculosis Infection

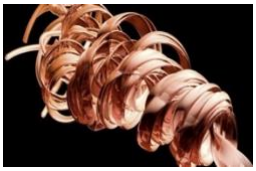
(EPFL, December 01, 2023)



A remarkable study led by Vivek Thacker from epfl, with support from Richa Mishra at the Complutense University of Madrid, unfolded how bacterial cords propagate Tuberculosis and the way they interact with host proteins. This research throws light on a yet unknown facet of the biophysics and function within the dreadful tuberculosis infection. Their pioneering work, funded by prestigious entities from around the globe, illuminated how the architecture of bacteria affects host function. Their discoveries are instrumental in comprehending the complex mechanics of not just tuberculosis, but also how bacterial pathogens infect host cells, thereby opening the avenue for more targeted and advanced therapies.
/web/2023/03-231201-36

New Insights into Origins of Life: The Role of Amyloids

(ETH Zurich, December 01, 2023)



A groundbreaking research led by Professor Roland Riek at the interdisciplinary Centre for Origin and Prevalence of Life, ETH Zurich, has unearthed intriguing links between amyloids and the transition between chemistry and biology, paving the way towards a better understanding of the origins of life. Equipped with extensive laboratory experiments, the team observed that these protein-like aggregates or amyloids can bind and stabilize RNA and DNA molecules. Moreover, they discovered a direct correlation between the nucleotide sequences in the genetic material and how it interacts with the amyloids, shedding light on the evolution and development of the genetic code. This study shines light on significant clues to the puzzle of the origins of life, long shrouded in mystery due to the eroding traces of evolution.
/web/2023/03-231201-43

Inoculation Against Diseased Fields

(University of Zurich, December 01, 2023)

A research collaboration between the universities of Zurich and Basel, Agroscope, and the Research Institute of Organic Agriculture (FiBL) has achieved a significant milestone towards sustainable agriculture. Led by researchers Marcel van der Heijden from the University of Zurich and Klaus Schläppi from the University of Basel, they have discovered a method to safely enhance crop yields without resorting to agricultural chemicals. Their research centered around the use of mycorrhizal fungi—beneficial organisms that aid plants in nutrient acquisition. In a swathe of trials on 54 maize farms across northern and eastern Switzerland, they integrated these fungi into the soil before sowing, recording crop yield improvements of up to 40%. Moreover, they found that soil indicators, primarily soil fungi, could reliably predict the success of inoculation in the majority of trial fields.
/web/2023/03-231201-72

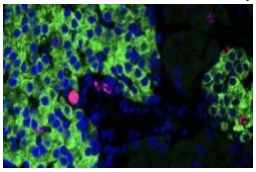
Pioneering Advancements in Tissue Regeneration and Wound Healing

(Paul Scherrer Institute, December 01, 2023)

The Paul Scherrer Institute (PSI), alongside Bibhas Roy, Tina Pekec, Luezhen Yuan, and headed by Prof. Dr. G.V. Shivashankar, has recently made strides in a process for aged tissue regeneration and wound healing. This development, published in Aging Cell, involves the mechanical reprogramming of fibroblasts. The research team focused on manipulating fibroblasts to foster aged tissue regeneration. Through their investigative process and hard work, they spurred interest from the pharmaceutical field, affirming their novel approach's potential for therapeutic applications. Prof. Dr. Shivashankar expressed confidence that their research breakthrough would find its way to clinical applications within a few years.
/web/2023/03-231201-11

Lipids and Diabetes are Closely Linked

(University of Geneva, December 05, 2023)



A groundbreaking study conducted at the University of Geneva (UNIGE) by Associate Professor Charna Dibner and Professor Pierre Maechler from the Department of Cell Physiology and Metabolism has offered new insights into identifying and controlling diabetes. The researchers utilized a "lipidomic" analysis to track the 24-hour cycle profile of various lipids in blood and adipose tissues. Notable discrepancies were discovered between the lipid profiles of type 2 diabetics and non-diabetics, especially at the start of the day when certain toxic lipids levels surged. Additionally, lysoPIs, a scarcely studied lipid category, seemed to play an unexpected role in diabetes development. These findings could pave the way for pioneering diabetes control methods, like creating tailored dietary supplements or molecules targeting lysoPI receptors.
/web/2023/03-231205-86

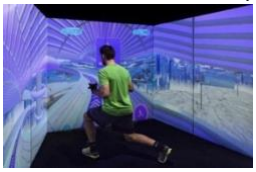
Replacing bone Saws with Smart Lasers

(University of Basel, December 08, 2023)

Under the leadership of Dr. Ferda Canbaz from the University of Basel and Professor Azhar Zam, now at New York University, a significant advancement in the world of biomedical engineering has been achieved. The research team has ingeniously developed a multi-functional system that blends bone cutting, depth control, and tissue differentiation, using three cohesive lasers. This ground-breaking system is an incredible leap forward in surgical precision and safety. Since the 1990s, lasers have mainly been utilized in ophthalmology, but their utilization in other surgical areas has largely been hindered due to safety concerns. This is where the team's achievements become crucial, as they address these safety concerns head-on with their latest publication in the specialist journal, Lasers in Surgery and Medicine.
/web/2023/03-231208-0d

A Game-based Rehabilitation Tool for Knee Ligament Injuries

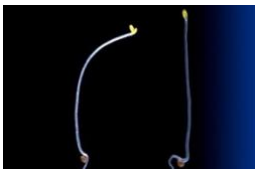
(ZHAW, December 08, 2023)



Researchers from Zurich University of Applied Sciences (ZHAW) and Zurich University of the Arts (ZHdK), led by Prof. Dr. Eveline Graf and Dr. Anna Lisa Martin-Niedecken respectively, have collaborated on a groundbreaking initiative focusing on game-based rehabilitation for knee ligament injuries. Named ExerUp, the game is a pioneering solution aimed at supporting athletes during rehabilitation. ExerUp employs the unique combination of motion-based activities with physical, temporal, and cognitive tasks for a holistic rehabilitation process. This research taps into interdisciplinary science and cutting-edge design to optimize both physical and cognitive training effects, all within a fun, game-based environment. The game is expected to significantly alleviate the workload of physiotherapists and cater to the needs of both professional and recreational athletes.
/web/2023/03-231208-a5

How Plants Determine Light Sources

(University of Lausanne, December 12, 2023)



Professors Christian Fankhauser of the Centre intégratif de génomique at the University of Lausanne (UNIL) and Andreas Schüler from the Swiss Federal Institute of Technology in Lausanne (EPFL) have lead an international research team to an exciting scientific discovery. Studying a mutant strain of Arabidopsis thaliana, they unveiled a remarkable transparency in the stem due to the replacement of air with liquid in intercellular channels. The researchers extensively examined this optical property and the photoreceptor initiating phototropism, published their vital findings in Science. This discovery enlightens us on how plants incredibly determine the direction of incoming light and optimize their positioning, influencing photosynthesis, an essential process in the food chain, at large.
/web/2023/03-231212-67

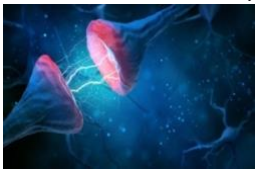
Promoting Healthy Brain Aging through Physical and Social Activities

(University of Zurich, December 15, 2023)

In an engaging new study conducted by Professor Emeritus Lutz Jäncke and co-lead Susan Mérillat at the University of Zurich (UZH), it was demonstrated how physical and social activities can significantly slow down brain aging in cognitively healthy adults over the age of 65. The research was based on a comprehensive longitudinal study investigating brain development and behavior in old age. It paid close attention to the correlation of memory performance and the thickness of the entorhinal cortex with the level of physical and social activity. The findings affirmed that those who were more active physically and socially exhibited a lesser decline in memory performance. This study underscores the importance of maintaining a balance of physical, mental, and social activities to preserve healthy brain function as we age.
/web/2023/03-231215-bc

Mapping the Brain for Insights into Evolution and Medicine

(EPFL, December 21, 2023)



A ground-breaking study from the EPFL's School of Engineering and the CHUV's Leenaards Memory Centre, led by Alessandra Griffa, along with Dimitri Van De Ville and SNSF Ambizione Fellow Enrico Amico from EPFL's Medical Image Processing Lab, has created a game-changing "brain traffic map". This research allows a comprehensive comparison of brain connectivity between humans and other mammals. The researchers utilized open-source diffusion (DWI) and functional magnetic resonance imaging (fMRI) data from humans, macaques, and mice in awakened and resting states.
/web/2023/03-231221-9e

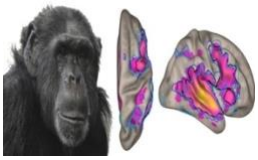
Discovery of the Role of Genetics in Hepatitis E Infection

(University of Lausanne, December 22, 2023)

A team of researchers from the University of Lausanne, EPFL and CHUV have achieved a milestone in Hepatitis E research. Led by Dr. Montserrat Fraga, Dr. Jérôme Gouttenoire, Professor Darius Moradpour, Ali Saadat and Professor Jacques Fellay, they have revealed for the first time the critical role of host genetics in response to hepatitis E infection. By analyzing patients with symptomatic hepatitis E infection, the researchers identified an enrichment of pathogenic genetic variants in particular genes instrumental in responding to type I interferon. This discovery not only paves the way for a more profound understanding of the mechanisms underpinning the disease but also facilitates an improved risk evaluation protocol for vulnerable individuals.
/web/2023/03-231222-9b

The Human Brain Can Discern Primate Emotions through Voice

(University of Geneva, December 22, 2023)



Professor Grandjean Didier and his team at the University of Geneva have made a remarkable revelation: humans can distinguish emotional vocalizations of primates, essentially understanding cross-species sentiments. Participants of the study were subjected to MRI scans while listening to primate emotional vocalizations via headphones, and the brain mapping results illustrated a clear pattern recognizing different primate emotions. This pivotal research fosters a profound understanding of our communication capabilities extending beyond our species. This revelation potentially triggers a reevaluation of how humans interpret and react to the emotional displays of other species. Further studies in this direction may dramatically impact the narrative of evolutionary biology and communication.
/web/2023/03-231222-10

Faster Pain Relief Potential for Botox

(Paul Scherrer Institute, December 22, 2023)

The Paul Scherrer Institut PSI has broadened the medical uses for Botulinum Toxin A1, commonly known as Botox. Led by Dr. Richard Kammerer, head of the Protein Engineering Group at PSI, and first-authored by Dr. Oneda Leka, the study proposes an innovative application of Botox for quicker relief from pain and other conditions. The team discovered that incorporating antibody-like proteins could accelerate Botox's potency, thus fast-tracking its effects on nerve signal transmission. Published in Nature Communications, the research signifies a potential expansion in the medical application of Botox and other nerve toxins.
/web/2023/03-231222-83

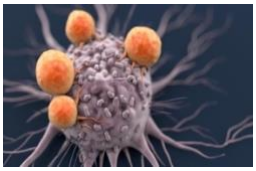
Early Primates Likely Lived in Pairs

(University of Zurich, January 08, 2024)

Research teams from the University of Zurich and the University of Strasbourg, led by lead researcher Charlotte-Anaïs OLIVIER from the Hubert Curien Pluridisciplinary Institute, have unveiled intriguing insights into primate social organization. Unexpectedly revealed, more than half of the primate species studied exhibit different forms of social systems, which suggests that our primate ancestors could have evolved from a flexible pair-living ancestor. Their comprehensive examination of primate populations in the wild disclosed that common social organizations are groups with multiple males and females, followed by groups with only one male with multiple females. Surprisingly, nocturnal Strepsirrhines, usually believed to be solitary, were also found often living in pairs.
/web/2024/03-240108-ab

Supercharging CAR-T Cells for Cancer Treatment

(EPFL, January 08, 2024)



At EPFL's Laboratory of Biomaterials for Immunoengineering, significant strides in cancer treatment research have been made under the leadership of Professor Li Tang. His team has successfully developed a CAR-T therapy that has not only consistently eliminated cancerous tumors in mouse models, but also attained complete remission in eleven human clinical trial patients. This innovative therapy, as documented in Nature Biotechnology, centers around tailored T-cells aimed at specific cancer cells, marking a transitory departure from traditional cancer treatments. Notably, the production of this therapy proves to be quicker and cost-effective compared to existing methods.
/web/2024/03-240108-57

Light Color Is Less Important for The Internal Clock than Originally Thought

(University of Basel, January 10, 2024)

Led by Dr. Christine Blume from the Centre for Chronobiology at the University of Basel, a new study challenges our understanding of sleep and circadian rhythm regulation by light. Contrary to the prevalent belief, the study found that the color of light has lesser importance than assumed when it comes to our internal clock workings. The team conducted their research using various scientific methods to understand the effects of calibrated blue-yellow light changes on human circadian rhythms. They discovered that light-sensitive ganglion cells play a central role, and the light's color impacts the internal clock and sleep less significantly than previously thought.
/web/2024/03-240110-8b

New Class of Oral Drugs Can Target Previously Untreatable Diseases

(EPFL, January 10, 2024)

EPFL's Prof. Christian Heinis, have achieved a groundbreaking feat in the realm of drug development. Their pioneering work has successfully led to the creation of cyclic peptides that can bind to disease targets and be ingested orally, a milestone that effectively tackles a longstanding challenge in the pharmaceutical industry. The research involved the synthesis and investigation of thousands of peptides, cherry-picking candidates with high affinity for specific disease targets. From a synthesized pool of 8,448 cyclic peptides, researchers discovered a notably high affinity towards the disease target, thrombin. In rodent testing, these peptides demonstrated an oral bioavailability up to a stunning 18%, an exceptional leap for biologics.
/web/2024/03-240110-de

Genetic Mutations Linked to Rare Diseases also influence more Common Diseases

(University of Lausanne, January 10, 2024)

In a comprehensive study by teams of Alexandre Reymond and Zoltán Kutalik, and first author Chiara Auwerx at the University of Lausanne and the SIB Swiss Institute of Bioinformatics, a new dimension to our understanding of genetic variants known as Copy-Number Variants (CNVs) has been revealed. Contrary to previously limited to rare and severe diseases, the team found CNVs to significantly influence the risk of more ubiquitous diseases in the general population. Employing rigorously adapted statistical approaches given the rarity of CNVs and binary nature of diseases, the study discovered 73 links between CNVs and diseases, encompassing 45 unique genomic regions and 40 common ailments, such as asthma, epilepsy, kidney failure, and heart disorders.
/web/2024/03-240110-55

Leveraging AI for Therapeutic Support in Psychotherapy

(University of Basel, January 11, 2024)

A research team at the University of Basel, led by Dr. Martin Steppan, has made significant strides in psychotherapy research by leveraging artificial intelligence. Their study aimed at exploring the reliability of AI systems in interpreting the emotional states of patients through facial expressions in video recordings, with highly promising results. This study employed artificial neural networks trained to discern six basic emotions. The AI system demonstrated remarkable precision, equaling and sometimes surpassing human capabilities, even in capturing fleeting emotions within milliseconds. This advancement in psychotherapy research presents a more efficient and sensitive approach to interpreting facial expressions, a task typically time-consuming for human therapists.
/web/2024/03-240111-4f

How The Brain Learns to Deal with The Unexpected

(University of Basel, January 12, 2024)

A research team led by Professor Tania Rinaldi Barkat at the University of Basel, with first author Patrícia Valério, recently unlocked the mystery of how our brains efficiently process surprises. Their study, published in Science Advances, offers meaningful insights into managing unexpected auditory stimuli during our development. The team utilized the "oddball paradigm," using young mice as subjects, and examined how the brain categorizes surprising sounds as “important” or “uninteresting.” this ability dramatically increases as we mature, allowing for rapid categorization without the expenditure of unnecessary energy.
/web/2024/03-240112-5a

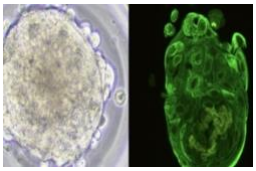
More than Thirty New Species of Bacteria Discovered in Patient Samples

(University of Basel, January 16, 2024)

Developmental leaps have been undertaken in the microbiology domain by a team headed by PD Dr. Daniel Goldenberger at the University of Basel and University Hospital Basel. The team has discovered and identified more than 30 new species of bacteria, some of which play a role in clinically significant infections. The researchers utilized a breakthrough approach known as novel organism verification and analysis (NOVA) based on whole genome sequencing, which led to their pioneering findings. This is critical as it will simplify the diagnosis of infections caused by rare pathogens and enhance the accuracy of treatment options.
/web/2024/03-240116-1f

Personalized Treatments for Lung Cancer through Tumor Cultivation

(University of Geneva, January 22, 2024)



An impressive breakthrough achieved by Serre-Beinier Veronique and her team at the University of Geneva and the Cardiology Geneva University Hospitals could potentially revolutionize treatments for lung cancer. The study unveils a method for growing lung tumor cells into tumor spheroids to assess the response of an individual's cancer to various treatments. The research involved special laboratory incubators where lung tumors were cultivated and then subjected to anticancer treatments. Mainly, it paves the way for personalized treatment, especially for "non-small-cell" lung cancer, which makes up most lung cancer cases.
/web/2024/03-240122-25

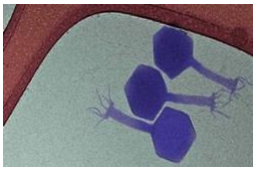
New Discovery in Guillain-Barre Syndrome Hints at Potential Therapies

(ETH Zurich, January 23, 2024)

Led by Daniela Latorre of ETH Zurich's Institute of Microbiology, with collaboration from the University Hospital Zurich and Neurocenter of Southern Switzerland in Lugano, a groundbreaking study has enhanced our understanding of Guillain-Barré Syndrome (GBS) pathophysiology. This study, with L. Súkeníková as its first author, established that certain immune system cells attack peripheral nerves in GBS patients, hinting at potential targeted therapies for specific GBS variants. Detailed in the prestigious journal Nature, the research illuminates the mechanism of this rare autoimmune condition affecting the peripheral nervous system. Crucially, this insight could lead to improved patient care and treatments.
/web/2024/03-240123-f1

Newly Discovered Bacteriophage Tackles Dormant Bacteria

(ETH Zurich, January 23, 2024)



A groundbreaking discovery made by ETH Zurich and the University of Basel, under the direction of ETH Professor Alexander Harms, has brought to light the Paride phage, a virus with a unique ability to target, awaken, and hijack the multiplication machinery of dormant bacteria for its own reproduction. The team coupled the Paride phage with the antibiotic called meropenem, disrupting bacterial cell wall synthesis without harming the phages. Notably, this potent combination was successful in eliminating bacterial cultures, despite the antibiotic alone having no effect. With this discovery, researchers aim to understand the genes or molecules triggering this mechanism closer, with hopes of developing treatments that could revolutionize how we combat dormant bacterial infections.
/web/2024/03-240123-95

How Social Attention Develops in Autistic Children

(University of Geneva, January 24, 2024)

Associate Professor Marie Schaer from the Department of Psychiatry at the University of Geneva Faculty of Medicine, has embarked on groundbreaking research. This research focuses on augmenting social attention in autistic children. Particularly, it offers invaluable insights into the transformative role of the Early Start Denver Model (ESDM) intervention in addressing social interaction deficits in these children. This innovative study employed an eye-tracking method to evaluate the changes in social attention. The results highlight the crucial need for timely therapeutic intervention to counteract the intensifying disinterest in social interactions amongst autistic children, especially those exhibiting substantial developmental delays.
/web/2024/03-240124-18

New Drug Substance Blocks Stress Response

(ETH Zurich, January 26, 2024)

A team of interdisciplinary researchers at ETH Zurich, led by researcher Katharina Gapp, has made an innovative scientific breakthrough in the field of stress management. They have successfully used a game-changing drug-making method known as PROTAC to develop highly targeted drug molecules, fostering a significant leap forward in the more precise treatment of stress-related conditions. The promising research involved the meticulous process of designing, synthesizing, and testing potential PROTAC agents to explore their behavior in cells and interactions with other molecules. The team's efforts illuminated their potential in absorption, dispersion, metabolism, and notable efficacy at measured doses.
/web/2024/03-240126-59

Improved Diagnosis of Sepsis in Children Thanks to New Global Criteria

(University of Zurich, January 29, 2024)

In a pioneering study by the University of Zurich and Seattle Children's Hospital, led by Prof. Dr. Luregn Schlapbach and Prof. Scott Watson, revolutionary strides have been made in sepsis diagnostics. They have successfully designed an evidence-based criterion and a novel scoring system, the Phoenix Sepsis Score, for diagnosing sepsis in children comprehending the severity of organ failure. Through a multi-year big-data initiative, an international task force assessed data from over 3.5 million children and formulated the Phoenix Sepsis Score using machine-learning methodology. This groundbreaking study carries significant importance, providing a universal standard to pinpoint this severe disease.
/web/2024/03-240129-1b

4. Nano / Micro Technology / Material Science

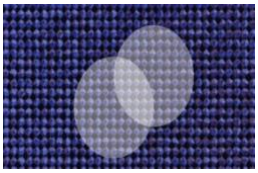
Revolutionizing Material Science with Bird Feather-mimicking Material

(ETH Zurich, December 04, 2023)

An extraordinary breakthrough in material science has been made by Eric Dufresne and his team at the Laboratory of Soft and Living Materials, ETH Zürich. They have ingeniously created a material with a structure mimicking that of a blue bird's feather, a development with wide-reaching applicability and interest. Achieved using a straightforward protocol, the researchers started with transparent silicone rubber, allowing it to swell in an oily solution in an oven at 60 degrees Celsius over several days. After cooling and extracting it from the solution, the result was an intricate nano-network of channels within the material. This pioneering work has fired up interest, with potential applications in areas as diverse as batteries to filtration technologies.
/web/2023/04-231204-23

Unraveling Light-Matter Interactions in Perovskite Nanocrystals

(ETH Zurich, December 05, 2023)



A breakthrough study led by Nuri Yazdani and Vanessa Wood at ETH Zürich, alongside colleagues at Empa, and in collaboration with Aaron Lindenberg of the SLAC National Accelerator Laboratory at Stanford University gives fresh insights into the dynamic processes occurring within perovskite nanocrystals. The team successfully captured the ultra-fast reactions happening when these crystals absorb photons, opening new vistas for controlling light-matter interactions. The researchers utilized picosecond-resolution snapshots to observe the crystal lattice of the nanocrystals upon absorbing photons. They found out that the excited electrons could straighten the skewed crystal lattice, resulting in effective interactions between excitons.
/web/2023/04-231205-21

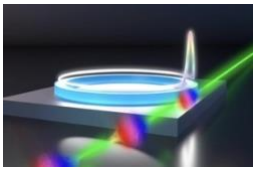
A Micro-ring Resonator with Big Potential

(EPFL, December 19, 2023)

In a recent study, the EPFL's Photonic Systems Laboratory (PHOSL), in collaboration with the Laboratory of Photonics and Quantum Measurements, have achieved a significant breakthrough in laser technology. Under the guidance of Prof. Dr. Camille Brès and Dr. Marco Clementi. They successfully integrated semiconductor lasers with photonic circuits containing silicon nitride micro-resonators. The integration led to a device capable of emitting uniform, precise light in the near-infrared and visible spectrum. The enhanced portability, lightness, and lowered energy consumption — coupled with a reduced production cost — mark a great leap in laser technology.
/web/2023/04-231219-0f

Groundbreaking Synergy between Nonlinear Optics and Electron Microscopy Unlocks New Capabilities in Material Studies

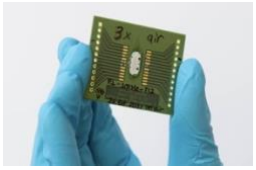
(EPFL, January 16, 2024)



A milestone in the realm of nonlinear optics and electron microscopy has been achieved under the leadership of Professor Tobias Kippenberg, in a joint effort between EPFL and The Max Planck Institute. This research demonstrates an innovative way to control electron beams and study materials, paving the way to new possibilities in various fields. This merging was made possible by playing with electron beams' interaction with nonlinear optical states in microresonators. This discovery heralds a promising future for potential applications like telecommunications, sensing, and light detection. The research has been generously supported by the DFG, AFOSR, SNF, and EU Horizon's 2020 project.
/web/2024/04-240116-9d

Turning Glass into a Light-Energy Harvesting Semiconductor

(EPFL, January 30, 2024)



Scientists from EPFL and the Tokyo Institute of Technology, including Associate Professor Yves Bellouard and first author Dr. Gözden Torun, have achieved a groundbreaking development: transforming glass into a light-energy harvesting device. The research hints to the capacity of glass to generate electricity when exposed to daylight, marking a significant scientific innovation. The scientists exposed tellurite glass to pulses of high-energy femtosecond laser light, and were able to etch nanoscale tellurium and tellurium oxyde crystals onto the glass, both semiconducting materials. Subsequently, they could write durable patterns that reliably generate an electric current when exposed to light. Additionally, the process involves only a single laser step and no other material other than tellurite glass is needed.
/web/2024/04-240130-b3

5. Information & Communications Technology

A Large Language Model for Medical Knowledge Enhancement

(EPFL, December 01, 2023)

In an effort to revolutionize medicine, Dr. Mary-Anne Hartley, along with her team from the Laboratory for Intelligent Global Health Technologies at the EPFL, has collaborated with Yale University and the International Committee of the Red Cross. Together, they have developed a compelling model named 'Meditron,' designed to refine and elevate medical knowledge. Anchored in reliable and transparent quality information sources, such as those offered by the Red Cross's clinical practice guidelines, Meditron merges technology and medicine to enhance healthcare protocols. Constantly tested and improved by researchers, under strict vigilance, the model promises a breakthrough in medical technology, ensuring safety.
/web/2023/05-231201-7f

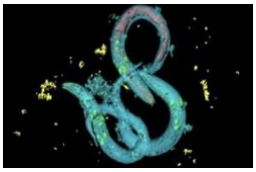
Leveraging AI for Plastic Debris Detection in Oceans

(EPFL, December 01, 2023)

At the intersection of AI and environmental conservation, researchers, including Prof. Marc Rußwurm, Prof. Tim van Emmerik, Prof. Devis Tuia, and Dr. Emanuele Dalsasso, from the Universities of Wageningen and EPFL, have pioneered a research project entitled ADOPT. This innovative study utilized AI models to detect and track plastic debris in oceans from satellite images - a crucial breakthrough towards efficient management of marine pollution. This research, conducted in partnership with Ocean Cleanup and ESA, successfully evaluated the AI model's predictions under challenging atmospheric conditions, such as the presence of clouds and fog.
/web/2023/05-231201-95

Boosting Brain Imaging Research with Automated Annotations

(EPFL, December 07, 2023)



Jointly conducted by researchers from EPFL, the Fondazione Helmut Horten, the Swiss Data Science Center, and Harvard University, a ground-breaking technique, which allows automatic annotations from a limited set of manual annotations, has been developed. Led by Sahand Jamal Rahi, this technique uses a deep learning convolutional neural network (CNN) to identify neurons accurately, bolstering the field of neuroscience, especially in the context of brain imaging. Testing on the widely recognized model organism, Caenorhabditis elegans, the method proved successful — identifying complex neuronal behaviors and increasing the analysis output by three-fold compared to full manual annotation.
/web/2023/05-231207-90

New Training Algorithm for Analog-based Neural Networks Betters Energy Efficiency

(EPFL, December 11, 2023)

A team of experts led by Professor Romain Fleury from the Laboratory of Wave Engineering at the EPFL School of Engineering, including first author Ali Momeni have developed a new algorithm that allows the training of an analog neural network as precise as its digital counterparts, paving the way for more efficient alternatives to energy-intensive deep learning hardware. The algorithm implements a two-step mechanism: a forward pass assessing error function based on output, and a backward pass determining error function gradient relative to network parameters. Over time and repeated iterations, the system self-adjusts for improved accuracy
/web/2023/05-231211-1c

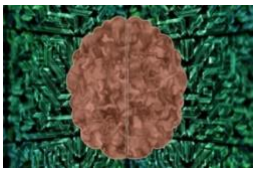
Artificial Intelligence for Safer Bike Helmets and Better Shoe Soles

(ETH Zurich, December 14, 2023)

A research team led by Professor Dennis Kochmann from ETH Zurich's Department of Mechanical and Process Engineering has celebrated a breakthrough with innovative AI tools. These tools expedite and automate the design of metamaterials which hold remarkable properties, distinguishing their ordinary counterparts. The researchers employed "variational autoencoders," a method the team utilized to train an AI model using a large dataset detailing the deformation behavior of actual structures. The AI model was then capable of predicting ideal structures for specified deformation responses effectively. This leap forward allows for the creation of metamaterials with a variety of applications such as energy-absorbing bike helmets and running shoes that offer an extra boost.
/web/2023/05-231214-fe

AI Unlocks New Insights in Neurodegenerative Disease Research

(EPFL, December 14, 2023)



Driven by PhD student Khalid Ibrahim under the supervision of Hilal Lashuel and Aleksandra Radenovic at EPFL's School of Life Sciences, a ground-breaking study has been conducted on neurodegenerative diseases. The goal of this research lies in developing new methodologies for monitoring the evolution of protein aggregation and pathology formation, thus shedding new light on the intricacies of these diseases. Utilizing a custom-built, multi-modal, multi-plane microscope, the team captured ultrafast 4D bright-field and fluorescence images which they then transformed into quantitative phase imaging (QPI).
/web/2023/05-231214-f5

Accurate Snow Measurement Thanks to AI and Satellites

(ETH Zurich, December 15, 2023)

At the cutting-edge of AI and environmental research, a team led by Professor Konrad Schindler at ETH Zurich, in conjunction with Swiss company ExoLabs, has unveiled an AI-backed snow depth measurement system. This technology does not only offer precise daily data but also manages to exceed previous accuracy levels in capturing intricate snow patterns. Built upon imagery captured by ESA's Sentinel-2 satellites, the robust AI system was trained using millions of real-world examples, proving its viability even in uncertain conditions. Besides providing a valuable tool for winter sports and mountain tourism, this breakthrough can potentially mitigate avalanche threats and aid hydro power plants for efficient operations, taking snow assessment and safety measures to greater heights.
/web/2023/05-231215-e4

Privacy and Data Protection: Guarding Our Digital Footprints in the Metaverse

(University of Zurich, January 17, 2024)

At the helm of groundbreaking research at the University of Zurich, Adrian Kuenzler, professor of Trade and Business Law, is directing critical inquiries on privacy and data protection under the burgeoning phenomena of the metaverse. Involved with The World Economic Forum's Global Future Council on the Future of Metaverse, Künzler's work primarily centers around fundamental rights in digital spaces. Through a rigorous legal and ethical analysis, he proposes technical safeguards to enable users to decide what data they wish to share in the metaverse. This research critically addresses legal and ethical hurdles and underscores the evolution of social platforms like Meta that are amplifying the importance of the metaverse.
/web/2024/05-240117-e5

METEOR: Harnessing AI for Environmental Science

(EPFL, January 17, 2024)

Marc Rußwurm, now an assistant professor at Wageningen University & Research, has led a team from EPFL and Wageningen University in a ground-breaking project. The researchers have successfully developed METEOR, an application utilizing artificial intelligence for environmental science recognition tasks, leveraging limited high-resolution drone and RGB satellite images. METEOR's game-changer lies in its adaptability and meta-learning capabilities. It skillfully generalizes learnings from earlier deployments to develop adaptation strategies for new situations. It effectively resolves the hurdle of training neural networks on varied-resolution and spectral-band aerial and satellite images, allowing reliable results with only a few representative images.
/web/2024/05-240117-9a

World's Most Powerful Supercomputers Support UN SDGs and Global Sustainability

(ETH Zurich, January 18, 2024)

The Federal Department of Foreign Affairs FDFA and ETH Zürich have unveiled the launch of The International Computation and AI Network (ICAIN) at the 2024 World Economic Forum. This groundbreaking initiative dedicates itself to developing sustainable, accessible AI technologies geared towards reducing global inequality. The aim is to facilitate global research initiatives that contribute to the well-being of society at large and advance the United Nations Sustainable Development Goals (SDGs). The project will incorporate the ultra-powerful supercomputers of ETH Zürich's Alps research infrastructure and the European LUMI supercomputer.
/web/2024/05-240118-50

Nanopores and Deep Learning Offer New Ways to Diagnose Diseases

(EPFL, January 19, 2024)

Leading a team at EPFL's School of Life Sciences, Professors Matteo Dal Peraro, Chan Cao, and Hilal Lashuel have developed a groundbreaking technique that synergizes biological and computational methodologies to recognize and evaluate protein modifications (PTMs), a critical factor in many diseases. The breakthrough lies in creating a method that synergizes the sensitivity of biological nanopores with the precision of deep learning. Aerolysin nanopores are used to identify unique current signatures of peptides and their PTMs, providing a highly accurate system for their automation and classification. The technique achieved success in identifying variations of alpha-synuclein proteins with single or multiple PTMs.
/web/2024/05-240119-54

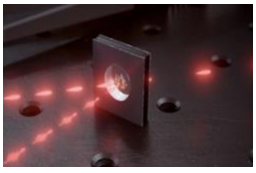
A Navigation System to Combat Bottlenecks in Medication Supply

(ETH Zurich, January 22, 2024)

A groundbreaking study led by Professor Frank Schweitzer of ETH Zurich outlines a flexible and efficient solution aimed at remedying shortages in the distribution of scarce medications. The research, primarily focusing on opiates in the US, analyzes a data-rich environment spanning over 40 billion distribution routes from 2006 to 2014, courtesy of the US Drug Enforcement Administration (DEA). Schweitzer's team proposes utilizing digital supply chains to monitor inventories in real time and reroute medication shipments along existing channels. This game-changing approach can effectively alleviate medication shortages without the need to instantaneously scale-up production.
/web/2024/05-240122-b9

Advancement in Mass-producible Quantum Memory Technology

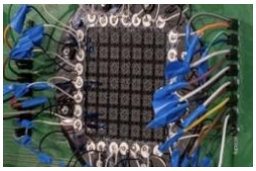
(University of Basel, January 24, 2024)



A groundbreaking milestone in quantum memory technology has been attained by Professor Philipp Treutlein and his research team at the University of Basel. They have successfully developed a miniaturized, mass-producible quantum memory element using atoms held in a minuscule glass cell. The process involved filling the tiny cell with rubidium atoms and then heating it to 100 degrees centigrade. This increased the vapor pressure, and when exposed to a magnetic field that supersedes Earth's by more than ten thousand times, it restructured the atomic energy levels. Through this manipulation, the team was successful in storing photons quantumly using an additional laser beam.
/web/2024/05-240124-ab

Sound-powered Sensors Stand to Save Millions of Batteries

(ETH Zurich, January 30, 2024)



Geophysics Professor Johan Robertsson of ETH Zurich and his team, along with Marc Serra-Garcia, have made a remarkable breakthrough in sensor technology. Their sustainable sensor, built to convert sound waves into energy, abolishes external power requirements, a real game-changer capable of conserving millions of batteries. This sound-sensitive passive sensor converts vibrational energy from sound waves into a tiny electric pulse to power electronic devices. Structured as a metamaterial, the sensor draws its unique properties from the organization of the material it is made of. This breakthrough has profound implications as it offers a sustainable and energy-efficient solution that could minimize battery waste across multiple industries.
/web/2024/05-240130-79

6. Energy / Environment

Innovative CO2 Management Techniques from ETH Zurich

(ETH Zurich, December 08, 2023)

The task of achieving Switzerland's ambitious goal of net-zero greenhouse gas emissions by 2050 has given rise to a pioneering pilot project led by Professor Marco Mazzotti at ETH Zürich, commissioned by the Swiss Confederation. Groundbreaking work has resulted in two potential answers for permanent CO2 storage - mineralization in recycled Swiss-made demolition concrete, and mineralization in a geological reservoir in Iceland. The team executed a comprehensive lifecycle analysis, covering CO2's capture, liquefaction, transportation, and permanent storage. Also, they investigated the amount of new CO2 produced during this process.
/web/2023/06-231208-97

New Project to Explore Feasibility of Wireless Charging of Electric Vehicles

(EMPA, December 11, 2023)

In an ambitious two-year project, energy supply company Eniwa AG, based in Buchs, Switzerland, steps forward in redefining vehicle charging solutions. Collaborating with Empa and researchers from the Institute for Sustainable Development at the ZHAW School of Engineering, the project seeks to navigate the technical feasibility of inductive charging for electric vehicles under everyday conditions. The intricate work involves retrofitting vehicles with innovative inductive charging systems and testing them in real-world e-car sharing programs. As part of the project, six to seven charging stations, including one at Empa, will be operational. The team envisions that wireless charging will significantly enhance user convenience, catalyzing the shift towards electromobility.
/web/2023/06-231211-ec

Heavy Metals in the Rivers of Greenland

(Eawag, December 15, 2023)

Chemist David Janssen from the Swiss Federal Institute of Aquatic Science and Technology (Eawag), with backing from the Swiss Polar Institute and the Leister Foundation, led a groundbreaking study gauging the heavy metal and nutrient density in rivers throughout southern and eastern Greenland. The research, consisting of meticulous sampling using a telescopic pole and measurements of water conductivity and temperature showed heavy metals, mostly from natural sources, to be in lower concentrations than the global average. This critical study provides valuable insights to stakeholders and local communities, enabling them to make informed choices regarding environmentally responsible resource development in the region.
/web/2023/06-231215-b2

Permafrost: A Ticking Time Bomb Beneath our Feet

(EPFL, December 21, 2023)

Michael Lehning and his squad at the Laboratory of Cryospheric Sciences (CRYOS) at EPFL bring to light the daunting future of glaciers amidst climate change in their recent feature in Dimensions magazine. This pivotal research spotlights the accelerating melt of glaciers due to increased temperatures and its subsequent impact on the climate. The article unravels the potential release of substantial volumes of CO2 and methane as a result of melting glaciers, posing a considerable risk to our global climate. Additionally, it points to other more obscure perils of thawing permafrost, such as the liberation of ancient bacteria, microbes and unwanted mercury concentrations.
/web/2023/06-231221-e4

Reinventing Energy Storage with Supercapacitor Technology

(Swisstech, January 09, 2024)

In a revolutionary energy storage solution, Clara Moldovan, CEO of Swistor and winner of the the 2020 Musy Award, has tensioned the boundaries of current lithium-ion battery technology. The cutting-edge supercapacitor technology she has developed promises high power, extended lifespan, and a non-variable operating range without jeopardizing safety. Through merging innovative supercapacitor devices with usual batteries, the technology boosts their performance and lifetime. Likewise, it enables efficient energy harvesters use for devices' continuous operation. The research, which was scaled up using industrial manufacturing methods, overcomes current limitations: slow charging, limited lifespan, and the adverse socio-environmental impact of Lithium-ion batteries production.
/web/2024/06-240109-0e

Towards a Climate-Neutral Switzerland: Three Strategies to Boost Green Electricity by 2035

(ETH Zurich, January 11, 2024)

Researchers from the University of Geneva, University of Bern, EPFL, and ETH Zurich, have established three groundbreaking strategies that could meet Switzerland's electricity demand and create jobs through renewable energy by 2035. The study was generously funded by the Swiss Federal Office of Energy's SWEET program. The research, a collaborative effort via the SWEET EDGE consortium involving numerous universities and partners, aims to achieve a climate-neutral energy system, burgeoning Switzerland's energy independence through domestic renewable production. Notably, the study revealed the potential for massive job creation through expanding renewable energies.
/web/2024/06-240111-f7

Capturing Greenhouse Gasses with The Help of Light

(ETH Zurich, January 15, 2024)

Breakthrough research has been realized by Professor Maria Lukatskaya and her team at the Electrochemical Energy Systems at ETH Zurich, utilizing light-reactive molecules to capture CO2. This revolutionary concept involves modulating the acidity of a liquid triggered by light, drastically addressing the greenhouse gas problem by enabling capture of significant CO2 amounts from the atmosphere. Critically, this new technology disengages from the substantial energy demands of conventional carbon capture technologies. The energy necessary for carbon capture theoretically arises from our very own Sun. With the aid of developed solvents that enhance the stability of light-reactive molecules over an extended period, this research stands crucial in the effort to decelerate global warming and meet climate objectives.
/web/2024/06-240115-d8

Unraveling the Causes of Brumadinho Dam Collapse

(ETH Zurich, January 17, 2024)

In a groundbreaking study, Professor Alexander Puzrin at ETH Zurich meticulously brings to light the causes of the Brumadinho dam collapse. Utilizing numerical and analytical models, the investigation delves into the physical mechanism behind the dam failure and highlights the latent risks associated with tailings dams, those that hold mining ore residues. Their findings indicate that the tragedy occurred due to the build-up of fine-grained, brittle material in the dam's tailings pond, precipitating a devastating mudslide. This crucial understanding carries significant implications for predicting potential dam failures, enabling the development of effective preventative strategies. Stress is also laid on the importance of diligent monitoring and thorough risk analysis of existing dams.
/web/2024/06-240117-2f

Incorporating Biochar in Concrete for Net-Zero Emissions

(EMPA, January 18, 2024)

A groundbreaking study led by Prof. Dr. Pietro Lura and Dr. Mateusz Wyrzykowski from Empa's Concrete & Asphalt lab discloses integration of biochar into concrete production, establishing a pathway toward achieving net-zero emissions. Building upon the concept of carbon capture, the method involves formation of carbon pellets comprised of water, cement, and biochar, intended for concrete production. A significant 20 percent by volume of these carbon pellets enables the research to achieve net-zero emissions, neutralizing emissions from the production of both the pellets and the concrete, therefore making profound strides towards climate targets.
/web/2024/06-240118-d4

Urban Heat Islands have a Health Cost

(EPFL, January 25, 2024)

An innovative research study led by EPFL's Assistant Professor Gabriele Manoli, alongside global collaborators including first author Katty Huang, has cast new light on the impacts of urban heat islands on human health and economies. Through an interdisciplinary approach, the team linked the temperature-related risks of urban heat islands into an economic viewpoint, evaluating health costs in 85 European cities. The research employed tactics from urban climatology, epidemiology, economics, statistics, and mathematical modeling. The key finding highlighted the significant adverse effects of urban heat islands on public health, demonstrating increased cardiovascular and respiratory risks and reduced life expectancy.
/web/2024/06-240125-85

Groundwater Levels are Sinking Ever Faster around the World

(ETH Zurich, January 26, 2024)

A study conducted by researchers from ETH Zurich and the University of California, Santa Barbara (UCSB), coauthored by Senior Scientist Hansjörg Seybold, gives a sobering picture of the rapid depletion of global groundwater resources. With unprecedented depth and breadth, the study amalgamates data from over 170,000 wells and 1,700 groundwater systems around the globe, spanning four decades. Their findings revealed a massive expansion of groundwater extraction leading to an accelerated decline in aquifers' water levels, especially since 2000. The situation is notably drastic in arid regions like California, the High Plains in the US, Spain, Iran, and Australia.
/web/2024/06-240126-19

Glacier Melting Destroys Important Climate Data Archive

(Paul Scherrer Institute, January 29, 2024)

Prof. Dr. Margit Schwikowski, Head of the Laboratory for Environmental Chemistry at Paul Scherrer Institut PSI, in collaboration with scientists from institutions part of the ETH Domain, has led groundbreaking research. Their work published in "Nature Geoscience" highlights the rapid loss of high-altitude glacier archives due to climate change-related melting. The team utilized data from ice cores and glacier samples from locations including the Alps and Caucasus to reveal the severe impact of climate change on these glaciers. This vital research emphasizes the imperative for action to mitigate climate change and protect these invaluable environmental records. Indications from past expeditions to Spitsbergen, Col del Lys, and Kilimanjaro serve to further underline the global urgency and broad scope of this research.
/web/2024/06-240129-ce

7. Engineering / Robotics / Space

An Astronomical Waltz Reveals a Sextuplet of Planets

(University of Bern, December 01, 2023)

The University of Bern and the University of Geneva have made strides in the exploration of exoplanets via their collaborative mission CHEOPS, led by Prof. Dr. Johannes Geiss of the University of Bern's Physics Institute and partnering professors from UNIGE's Astronomy Department. These investigations elucidated invaluable data on the size, formation, and evolution of known exoplanets. A crucial pivot for space research, the findings not only fortified the University of Bern's Department of Space Research and Planetary Sciences, but it also merited the accolade of the National Center of Competence in Research (NCCR) PlanetS.
/web/2023/07-231201-21

A Color-based Sensor to Emulate Skin's Sensitivity

(EPFL, December 04, 2023)

Led by Jamie Paik from EPFL's Reconfigurable Robotics Laboratory (RRL), an ingenious multi-sensing device dubbed 'ChromoSense' has been birthed. This device employs color to simultaneously detect myriad mechanical and thermal stimuli, setting a novel standard in the realm of detection tools. Through color detection, ChromoSense outperforms its predecessors in size and efficiency — no cameras or multiple detection elements needed. Not only is integration into different materials a breeze, its ongoing development for localized force detection and identifying a material's limit during shape changes poses significant potential for future autonomous and portable technologies.
/web/2023/07-231204-5e

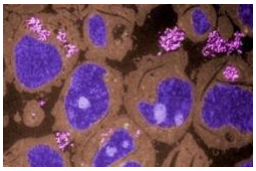
Wind-powered Sailboat by SP80 and EPFL Eyes World Record

(EPFL, December 08, 2023)

EPFL and SP80 have combined their knowledge and efforts in an ambitious project: making a boat powered purely by the wind go faster than a conventional motorboat. Bolstered by the support of over 80 EPFL alumni contributing to the project's generation, the diverse team now boasts around 50 members including 11 SP80 company employees and 23 EPFL students. This real-world application initiative is part of the MAKE program that enhances discipline-based learning through interdisciplinary projects. Founders of SP80; Mayeul van den Broek, Benoit Gaudiot, and Xavier Lepercq, who met through the Hydrocontest EPFL Team, are aiming to set a new nautical speed record with their cutting-edge wind-powered boat.
/web/2023/07-231208-ae

Empa and CSL Vifor Host International Workshop on Nano-bio Interfaces

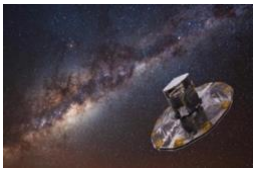
(EMPA, December 15, 2023)



Exciting progress in the field of nanomedicine is coming our way, thanks to a productive collaborative workshop organised by Empa's lead researcher Prof. Dr. Peter Wick along and CSL Vifor's Beat Flühmann. Focusing on the development of nanomedicines for intravenous iron treatment, this collaboration marks an innovative shift in our understanding of the biomedical interaction of nanomedicines within the human body. The workshop involved several complementary research teams passionately exchanging ideas with industry representatives in an open atmosphere. The goal? To describe the clinically relevant properties of nanomaterials and understand their modes of action as new therapeutics.
/web/2023/07-231215-86

Revealing Celestial Distances using the "Music" of Stellar Bodies

(EPFL, December 18, 2023)



The Standard Candles and Distances Group at the EPFL, headed by Professor Richard Anderson, recently delivered a momentous scientific revelation. Authored by Saniya Khan, their article in Astronomy & Astrophysics delineates a fresh approach in determining interstellar distances using asteroseismology. The teams used asteroseismic data collected from Kepler, K2, and TESS missions to calculate the internal vibrations of celestial bodies and, subsequently, their precise distances. The groundbreaking technique, testing the exactitude of parallax measurements from ESA's Gaia telescope, stands to redefine astrometric understanding of over two billion stars.
/web/2023/07-231218-91

High-Tech Worker in the Greenhouse: Floating Robotics Develops New Picking Robot

(ETH Zurich, December 20, 2023)

The ETH Zurich spin-off, Floating Robotics, headed by Professor Salman Faraji, from Robotic Systems Lab, has developed an impressive breakthrough—a picking robot specifically designed for Beerstecher AG greenhouse in Hinwil. The robot, armed with an integrated camera and a robotic arm, is designed to revolutionize agriculture by automating labor-intensive tasks such as defoliating, harvesting, and boxing vegetables. This robotic marvel is equipped with a unique ability: using its integrated computer system, it can monitor crops, and distinguish between different plants and objects.
/web/2023/07-231220-97

An Innovative Method of Reinforcing Buildings

(EMPA, December 22, 2023)

Empa and its Mechanical Systems Engineering Lab are working on a project that focuses on the recycling of carbon fiber-reinforced polymer (CFRP) lamellas, primarily used to strengthen buildings. The project team hopes to devise railway sleepers from recycled concrete, using CFRP lamellas salvaged from demolitions. This pioneering research came to fruition with the generous funding from the Empa Zukunftsfonds foundation. The anticipation heightens for profound outcomes by October 2023. The potential to breathe a new lease of life into materials destined for landfills makes this research pivotal for addressing waste management issues.
/web/2023/07-231222-05

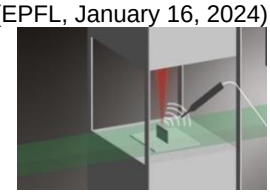
Innovative Automated Crack Detection for Concrete Structures

(EPFL, January 15, 2024)

A critical breakthrough in the field of civil engineering has recently been achieved by Enrique Corres Sojo, a doctoral assistant at the Structural Concrete Laboratory (IBETON) at EPFL's School of Architecture, Civil and Environmental Engineering (ENAC), in collaboration with Master's student Hugo Nick. The groundbreaking research involved testing two novel automated crack detection methods. The first method compares images to identify reference points, thus generating displacement and deformation fields. The second method employs a detection algorithm using artificial intelligence to analyse a single photo of a crack. These automated methods ideal for improving inspection accuracy, especially in hard-to-reach areas, stand to revolutionize the field of civil engineering.
/web/2024/07-240115-88

Pioneering Approach in Laser Additive Manufacturing: Listening for Defects as they Happen

(EPFL, January 16, 2024)



In a joint study by researchers at the EPFL and Empa, led by Professor Roland Loge, a significant innovation has been reported in the realm of laser additive manufacturing. Their breakthrough highlights the ability to detect and correct manufacturing defects in real-time using a combination of acoustic emission measurements and X-ray imaging. The team achieved this by conducting experiments using a miniaturized LPBF printer developed by Dr. Steven Van Petegem's group, along with an ultra-sensitive microphone inside the printing chamber. Their remarkable findings, facilitated by signal processing expert Giulio Masinelli's adaptive filtering technique from Empa, can drive better understanding and refinement of the manufacturing process.
/web/2024/07-240116-d9

Soldering Wounds with Light and Nano Thermometers

(EMPA, January 19, 2024)

Achieving a significant medical breakthrough, a research team led by Oscar Cipolato and Inge K Herrmann from the Particles Biology Interactions laboratory at Empa in and the Nanoparticle Systems Engineering Laboratory at ETH Zurich, collaborating with surgeons from around the globe, has unveiled a smart wound closure system based on laser soldering technology. The system, advanced using a unique bonding agent composed of metallic and ceramic nanoparticles, and guided by nano-thermometry, permits incredibly precise real-time temperature control. This precision makes the method remarkably suitable for minimally invasive surgery, allowing for fast, stable, and biocompatible bonding of wounds on challenging tissues and organs.
/web/2024/07-240119-ea

Green Light for LISA Mission to Investigate Gravitational Waves

(ETH Zurich, January 26, 2024)

On a pioneering quest for a deep-space breakthrough, over 120 research institutions, including ETH Zurich and the University of Zurich, are involved in the groundbreaking LISA mission. Prof. Philippe Jetzer (University of Zurich) and Prof. @Domenico Giardini (ETH Zurich), have been closely cooperating on the project for more than tow decades, and are both seasoned researchers in the fields of gravitation and astrophysics, and seismology and geodynamics respectively. This mission is set to change our perception of the cosmos by enabling the detection and observation of gravitational waves. The LISA mission aims to pave new scientific paths by developing superior global models and pipelines for data analysis, and identifying gravitational wave sources.
/web/2024/07-240126-3d

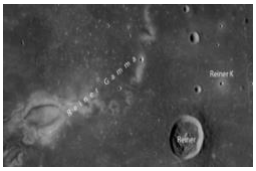
Swiss Tech Helping Uncover the Origins of the Universe

(EPFL, January 26, 2024)

The Square Kilometer Array Switzerland (SKACH) celebrates two years' membership of a monumental global scientific initiative aimed at constructing the largest scientific facility ever created. With its secretariat hosted at EPFL, researchers are proactively solving critical mysteries in astrophysics. Their work is poised to redefine understanding of our cosmological model, galaxy evolution, cosmic magnetism and even the origins of life. The profound breakthrough here lies within the innovative use of telescope arrays that far exceed the current sensitivity and speed of contemporary radio telescopes. These advancements are furnishing scientists with new insights into galaxy evolution, the cosmological model, cosmic magnetism, and origins of life.
/web/2024/07-240126-19

Discovery of Magnetic Anomalies in Lunar Rocks

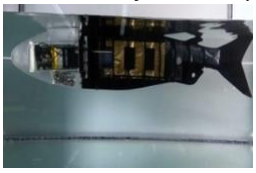
(University of Bern, January 31, 2024)



Researcher Dr. Ottaviano Ruesch from the University of Münster, with contribution from Dr. Valentin Bickel at the University of Bern, have identified unique, dust-covered rocks on the lunar surface, exhibiting magnetic anomalies. This represents a notable scientific breakthrough as it is the first time such distinctive rocks have been discovered on the Moon. Their research involved using advanced data processing methods to analyze over a million images taken by the Lunar Reconnaissance Orbiter spacecraft. They identified around 130,000 interesting rocks, eventually discovering a boulder with distinctive dark areas, attributed to its peculiar dust structure.
/web/2024/07-240131-80

Lighter, Safer, More Robust Artificial Muscles Developed by ETH Zurich

(ETH Zurich, January 31, 2024)



A breakthrough in artificial muscle technology has been made by a team of researchers at ETH Zurich, led by Assistant Professor Robert Katzschmann, together with Stephan-Daniel Gravert, Elia Varini, and colleagues. They have developed HALVE actuators, short for "hydraulically amplified low-voltage electrostatic", which are lighter, safer, and more robust than current alternatives. These artificial muscles feature a unique shell structure using a high-permittivity ferroelectric material that can store substantial amounts of electrical energy. This development allows for low electrical voltage usage, making them waterproof, more durable, and safe to touch. This significant advancement paves the way for their application in novel robots, prosthetics, wearables, and wearable technologies.
/web/2024/07-240131-0a

8. Physics / Chemistry / Math

Identifying Vintage Wines by their Chemical Signature

(University of Geneva, December 06, 2023)

Researchers from the University of Geneva (UNIGE), lead by Full Professor Alexandre Pouget, in collaboration with the Institute of Vine and Wine Science at Université de Bordeaux, under the leadership of Professor Stéphanie Marchand-Marion, have achieved an unparalleled accomplishment. They have successfully identified the unique chemical mark of red wines from seven major Bordeaux vineyards with an astounding 100% accuracy. Their groundbreaking study was executed by cleverly applying intelligence tools to existing data, offering new insights into a wider understanding of what shapes wine's identity and sensory properties. This discovery not only supports more informed decision-making in the winemaking industry but can also provide a potent weapon against wine counterfeiting.
/web/2023/08-231206-fb

New State in Quantum Material Hints at Future Tech Breakthroughs

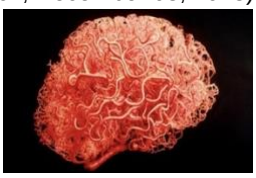
(EPFL, January 25, 2024)

Researchers from EPFL, Henrik Rønnow and Frédéric Mila, in cooperation with the Paul Scherrer Institute, Carnegie Mellon University in Qatar, Kyoto University, and Tohoku University, have uncovered a new and unprecedented behavior in the quantum material strontium copper borate. This discovery poses compelling questions for our current understanding of quantum physics and paves the way for potential future technologies that we have not even thought of yet. These findings were made possible through the application of neutron scattering and massive magnetic fields.
/web/2024/08-240125-05

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

Towards a New Era of Drug Delivery: Microvehicles Steered Through Blood Vessels for the First Time

(ETH Zurich, December 08, 2023)



A promising study pioneered by Professor Daniel Ahmed from ETH Zürich, in collaboration with the University of Zurich and Universitätsspital Zürich, delves into ground-breaking technologies for drug delivery. The innovative research directed microbubbles using ultrasound through narrow vessels in mice-brains, marking a substantial breakthrough in the field of medical science. The primary aim was to establish feasibility of guiding these micro-vehicles along blood vessels particularly in the brain. Although the micro-bubbles weren't equipped with medication, the team envisages enhancing this technology to hold therapeutic molecules on the bubble surface. With its promising implications, this research brings hope to targeted treatment for conditions like cancer, stroke, and psychological disorders, potentially paving way to development of novel treatments.
/web/2023/11-231208-b4

Record-breaking Number of New Spin-off Companies at ETH Zurich in 2023

(ETH Zurich, January 09, 2024)

In 2023, an impressive record of 43 spin-offs emerged from ETH Zurich, Switzerland, fostering a dynamic drive in the country's entrepreneurial landscape. Notably, a standout is apheros, led by CEO Julia Carpenter, pioneering in manufacturing innovative metal foams, purposed primarily for cooling electronic devices, thus offering energy-efficient solutions. Each venture was assiduously supported by ETH's Office for Knowledge Transfer and Corporate Relations, from their conception to the growth stages. This support has consistently proven fruitful, as indicated by a 2020 University of St. Gallen study. It revealed that ETH spin-offs outperformed their Swiss startup peers- creating more employment opportunities and yielding a higher propensity for acquisitions.
/web/2024/11-240109-7b

12. General Interest

University of Bern Supports the WHO in the Area of Biosafety and Biosecurity

(University of Bern, December 22, 2023)

The Institute for Infectious Diseases' Biosafety Center at the University of Bern, under the leadership of Director Kathrin Summermatter and Deputy Monika Gsell, is proud to announce its newly established role as a World Health Organization (WHO) Collaborating Center. This significant alliance between global health and leading scientific institutions is set to fortify biosafety and biosecurity measures worldwide. With a four-year collaboration framework, the Bern Biosafety Center will notably chair the WHO's technical advisory group on biosafety and biosecurity (TAG-B) and collaborate with other WHO Collaborating Centers. Essential elements include offering customized training programs, developing operational guidelines for high-containment labs, and expanding technological support which will bolster WHO's capability and training in biosafety and biosecurity.
/web/2023/12-231222-22

13. Calls for Grants/Awards

Six SNSF Starting Grants for the University of Basel

(University of Basel, December 01, 2023)

The Swiss National Science Foundation (SNSF) has honored six researchers from the diversified fields of biomedicine, chemistry, environmental sciences, history, and urban studies at the University of Basel with the prestigious Starting Grants. This grant will enable these researchers to propel their investigative work forward with a dedicated team, accelerating advancements in their respective fields. Some of the grantees are at the cusp of their academic appointment as assistant professors. Overall, the SNSF will extend overwhelming support of CHF 1.7 to 1.8 million over five years towards each of these research initiatives.
/web/2023/13-231201-40

Watt d'Or 2024: ETH Zurich and AEW Energie Shine with Innovative Algorithm

(ETH Zurich, January 11, 2024)

Congratulations to ETH Zurich and Aargau-based AEW Energie AG for securing the Watt d'Or 2024 in the "Energy technologies" category. This honor recognizes their joint development of the "Online Feedback Optimization" algorithm, a breakthrough contribution poised to make the expansion of solar energy more manageable and grid-friendly. This pioneering algorithm is a significant stride towards addressing challenges associated with the growing presence of photovoltaic systems in the Swiss grid infrastructure. It solves optimization problems in the electrical grid effectively, thereby promising to lower investment costs for grid operators in the foreseeable future. Moreover, it bolsters grid stability and ensures a secure electricity supply as reliance on solar energy extends.
/web/2024/13-240111-97

Upcoming Science and Technology Related Events

Swiss Winter Conference on Ingestive Behavior
February 18-22, 2024
https://www.winter-ingestion.uzh.ch/en.html
Scientific, Research & Development
St. Moritz

Swiss Cyber Security Days
February 20-21, 2024
https://scsd.ch/en
IT, Web & Electronic
Bernexpo

Digital Trust 5th Trinational Days
January 10-11, 2024
https://www.tri-csd.ch/
IT, Web & Electronic
FHNW Campus, Olten

Meeting of the High-level Advisory Board on the Productive Index
February 21, 2024
https://is.gd/abkDbg
Business & Economy
Palais des Nations, Geneva

Annual GENAP Summit
February 22-23, 2024
https://genapsummit.com/
Life Sciences, Health Care & Medical
Hilton Geneva Hotel & Conference Centre

Annual World Congress on Pediatrics
February 22-23, 2024
https://pediatrics.conferenceseries.com/
Life Sciences, Health Care & Medical, Pharmaceutical & Biotechnology
Zurich

Annual European Healthtech CEO Forum
February 27, 2024
https://www.sachsforum.com/5ehtf-about.html
Life Sciences, Health Care & Medical
Hotel Hilton Zurich Airport, Opfikon

Powershell Day Switzerland
February 27, 2024
https://is.gd/EzxK1i
IT, Web & Electronic
Millenium Lausanne-Crissier

Fourteenth Meeting of the Task Force on Water and Climate
February 28, 2024
https://unece.org/info/events/event/386480
Environment & Climate Conditions
Palais des Nations, Geneva

Doctor's Forum Davos
March 4-8, 2024
https://www.davoscongress.ch/aerzteforum
Life Sciences, Health Care & Medical
Congress Centre Davos

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