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Science-Switzerland, October – November 2024

News on Swiss science, technology, education and innovation

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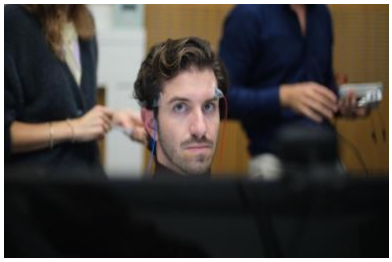
Enhancing Memory without Surgery

(EPFL, October 31, 2024)



A collaborative effort led by Prof. Dr. Friedhelm Hummel and Prof. Dr. Olaf Blanke has achieved a remarkable breakthrough in neuro-technology. Their innovative approach utilizes non-invasive brain stimulation to boost memory without the need for surgery, representing a significant advancement in cognitive science. The research employs transcranial temporal interference stimulation (tTIS) to specifically target brain regions responsible for memory and navigation. This technique holds promise for developing targeted therapies for individuals with cognitive impairments, such as the elderly, brain trauma patients, and those with dementia.
/web/2024/00-241031-0a

Record Broken for the Longest Hyperloop Trial

(EPFL, November 07, 2024)

The LIMITLESS project, alongside EPFL, HEIG-VD and Swisspod Technologies, has successfully completed the longest-ever vacuum capsule journey in Europe's first operational Hyperloop test facility. This scientific breakthrough achieved the full-scale equivalent of a 141.6 km hyperloop journey at speeds reaching 488.2 km/h within a controlled low-pressure environment. The team developed a novel Linear Induction Motor (LIM) as a critical part of the hyperloop propulsion system to achieve these results, designed for enhanced performance at high speeds. This milestone demonstrates hyperloop technology's viability for sustainable and rapid travel, potentially revolutionizing intra-continental travel. Additionally, the innovations from the LIMITLESS project could influence a range of industries, such as automotive, metro systems, rail, and aerospace.
/web/2024/07-241107-b0

Breakthrough in CO2 Capture and Fixation by Algae

(University of Basel, October 18, 2024)

Researchers from the University of Basel and Kwansei Gakuin University in Japan, led by Prof. Dr. Ben Engel and Dr. Manon Demulder, have discovered a protein shell, named PyShell, that is essential in the efficient CO2 fixation process in diatoms, an algae species. Using cutting-edge imaging techniques like cryo-electron tomography, researchers uncovered the intricate molecular structure of PyShell and its role in enhancing the efficiency of CO2 fixation. This pivotal discovery holds promise for the development of new carbon-capture technologies critical to combating climate change.
/web/2024/03-241018-bd

1. Policy

How Smart Toys Spy on Kids

(University of Basel, October 27, 2024)

Researchers from the University of Basel, led by Professor Isabel Wagner, along with first author Dr. Julika Feldbusch, have conducted an important study on the security and data protection of twelve popular smart toys. The analysis included well-known toys such as the Toniebox, Tiptoi smart pen, Edurino learning app, Tamagotchi virtual pet, Moorebot, and Kidibuzz. The study focused on evaluating these toys against criteria such as security, data protection, transparency, and compliance with the EU General Data Protection Regulation. The findings revealed significant data security issues, such as unencrypted data traffic and potential data transmission to manufacturers. To address these risks, the researchers propose implementing a data protection label on toy packaging to help parents make informed choices.
/web/2024/01-241027-9b

Impact of Social Exclusion on Voting Patterns

(University of Basel, November 08, 2024)

Researchers from the University of Basel, led by Natalia Bogatyreva, have explored the intriguing relationship between social exclusion and voting behavior. Their study reveals that socially excluded individuals are less likely to participate in elections and examines the potential link between experiences of ostracism and voting tendencies. The research involved analyzing data from two polls conducted across 11 European countries, including insights from 5,765 participants on their voting habits and experiences with social exclusion. Contrary to the hypothesis that socially excluded individuals may lean towards populist parties, the findings suggest they gravitate more towards centrist and moderate parties, potentially seeking reintegration.
/web/2024/01-241108-24

Nuclear Waste Storage Needs to Withstand an Ice Age

(University of Bern, November 15, 2024)

A collaborative study led by Dr. Marius Büchi from the University of Bern, alongside researchers from Eawag, ETH Zurich, and the University of Basel, and in partnership with Nagra , has made progress in understanding the geological history of the quaternary period. The research focused on sediment samples drilled near Bülach in the Canton of Zurich lowlands. Employing an innovative method, the researchers analyzed helium-4 concentrations in the water of sediment pores to date the sediments. This provides crucial information for secure nuclear waste storage solutions that can endure potential glacial advances. By examining sediments in an ancient lake basin sculpted by Alpine glaciers, their work underscores the necessity for robust underground radioactive waste storage, especially with potential future glaciations looming.
/web/2024/01-241115-db

Previously Unknown Compound Discovered in Drinking Water

(University of Zurich, November 22, 2024)

A scientific discovery in water safety research has emerged from a collaborative effort between Associate Professor Dr. Julian Fairey from the University of Arkansas, and Dr. Juliana Laszakovits from ETH Zurich. After ten years of meticulous research, they successfully identified a previously unknown compound in chloraminated drinking waster. The research team successfully synthesized and characterized the compound named chloronitramide anion, marking the first time it has been isolated and studied. While Switzerland's drinking water systems do not use chloramination, this circumstance provided an ideal control environment for comparison with regions like the US that use this purification method. Currently, the toxicity profile of this newly identified compound remains unknown and requires extensive further investigation.
/web/2024/01-241122-af

Disaggregating Carbon Sinks for Accurate Climate Action

(University of Bern, November 22, 2024)

A study from researchers at Oxford and Bern Universities has uncovered a significant oversight in how we measure climate action effectiveness. Led by Oxford's Prof. Dr. Myles Allen, with key contributions from Bern's Prof. Dr. Thomas F. Stocker, the research reveals how current net-zero calculations may be inflated by including natural carbon absorption from forests and oceans. The research team introduces the concept of Geological Net Zero, advocating for separate accounting of natural carbon sinks to provide more precise measurements. The study's recommendations for revised net-zero calculations could fundamentally reshape climate policies worldwide, ensuring more transparent and effective approaches to combat climate change.
/web/2024/01-241122-47

2. Education

The More Female Classmates at School, the Higher a Woman's Pay Later on

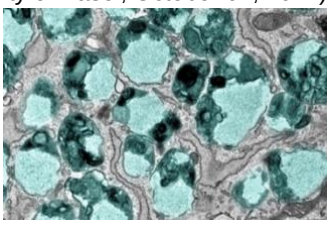
(University of Basel, November 08, 2024)

Professor Armando Meier from the University of Basel and Professor Demid Getik from the Durham University have conducted a study analyzing the long-term effects of primary school class gender composition on occupational choices and the gender wage gap in Sweden. Using data from over 750,000 students who completed primary education in Sweden between 1989 and 2002, the study reveals that girls in classes with a higher proportion of female classmates achieve better grades and are more likely to enter traditionally male-dominated fields. Notably, women from classes with 55% female composition earned approximately $350 more annually at age 30 than those from 45% female classes. Published in the American Economic Journal: Economic Policy, this research underscores the significant role gender composition plays in educational settings, potentially leading to a more equitable workforce. The findings offer critical insights for educators and policymakers aiming to promote gender equality from early education stages.
/web/2024/02-241108-6a

3. Life Science

New Target to Treat Severe Autoimmune Disease

(University of Basel, October 01, 2024)



A breakthrough from the University of Basel, spearheaded by Prof. Dr. Anne Spang, offers new hope for those suffering from LRBA deficiency, a rare and severe autoimmune disease. The first author, Viktória Szentgyörgyi, along with a team of researchers, successfully identified critical mechanisms involved in the cellular recycling process in patients with this condition. Their research uncovered two specific defective recycling steps in the cells of LRBA deficiency patients, leading to the buildup of enlarged cell compartments, which cause inflammation and tissue damage.
/web/2024/03-241001-c0

Breakthrough in Understanding Sex Determination

(University of Lausanne, October 01, 2024)

A team of researchers from the University of Lausanne, led by Thomas Lesaffre and Prof. Dr. John Pannell, has made a groundbreaking discovery in the field of sex determination. Their study delves into the genetic mechanisms that dictate an individual's biological sex in both plants and animals. By examining genetic systems like XY in humans and ZW in birds, the researchers uncovered how evolution drives shifts from hermaphroditism to separate sexes. This study not only broadens our understanding of floral diversity but also provides crucial insights into the evolutionary processes shaping biological diversity.
/web/2024/03-241001-3d

Towards Individualized Tumor Irradiation Therapy

(Paul Scherrer Institute, October 01, 2024)

Dr. Francesca Albertini and her team of researchers at the Paul Scherrer Institute have pioneered a revolutionary new procedure for individualized daily tumor irradiation. The significant breakthrough involves an innovative method for adapting treatment plans, markedly reducing the duration of the irradiation process. Conducted as a feasibility study, the research involved treating five patients with tumors in bony regions such as the skull and its base. This new procedure is crucial as it optimizes the speed of the tumor irradiation process, minimizing the time patients need to spend on the treatment couch and potentially expanding access to proton therapy for more individuals.
/web/2024/03-241001-70

How a Bacterium Becomes a Permanent Resident in a Fungus

(ETH Zurich, October 03, 2024)

A research team led by Prof. Dr. Julia Vorholt and doctoral student Gabriel Giger from ETH Zurich have made a groundbreaking discovery in understanding endosymbiotic relationships. Their study uncovers the intriguing dynamics between two organisms: how a bacterium establishes itself as a permanent resident within the fungus Rhizopus microsporus. The researchers developed an innovative method to inject bacteria into fungal cells without causing damage, allowing observation of the early stages of endosymbiosis. This study highlights the delicate nature of these nascent systems and underscores the necessity of mutual benefit for both host and resident organisms.
/web/2024/03-241003-f5

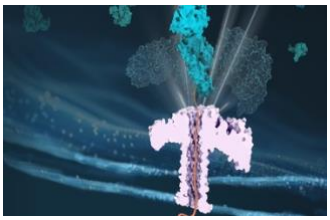
Reducing Herbivore Damage Using Biodiversity Instead of Insecticides

(University of Zurich, October 08, 2024)

A collaborative effort led by Prof. Dr. Yasuhiro Sato from Hokkaido University, and Prof. Dr. Kentaro Shimizu from the University of Zurich, in collaboration with Kyoto University, has resulted in a revolutionary method for studying plant genetics called Neighbor GWAS. This breakthrough uses a physics model to analyze genetic interactions between neighboring plants, highlighting previously unknown complexities in plant dynamics. Conducting two years of large-scale experiments, the researchers grew 6,400 Arabidopsis thaliana plants in open fields at the Irchel Campus in Zurich and in Japan.
/web/2024/03-241008-6c

New Insights into Protein Mechanisms using Nanopore Technology

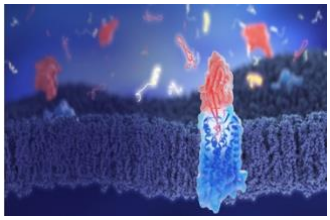
(University of Geneva, October 09, 2024)



A groundbreaking discovery by researchers at the University of Geneva, in collaboration with EPFL, has revealed how certain cellular "helper" proteins, crucial for maintaining protein quality, manage to reshape other proteins. After decades of debate, this insight was achieved using cutting-edge nanopore technology by Assistant Professor Chan Cao's team, confirming the Entropic Pulling mechanism first theorized in 2006 by Prof. Dr. Paolo De Los Rios at EPFL and Prof. Dr. Pierre Goloubinoff at the University of Lausanne. These helper proteins generate a force called Entropic Pulling, now measured to be approximately 46 piconewtons over 1 nanometer, enabling them to effectively untangle and refold proteins within cells.
/web/2024/03-241009-ac

Tiny Antibodies to Fight the Dangerous Effects of Opioids

(University of Geneva, October 10, 2024)



Research led by Associate Professor Miriam Stoeber at the University of Geneva, in collaboration with Assistant Professor Andreas Boland, has resulted in the development of new nanobodies derived from llama antibodies. These nanobodies have shown the remarkable ability to bind tightly and durably to specific opioid receptors in the brain. This discovery holds tremendous potential for reversing or reducing the adverse side effects of opioids. The capacity of these nanobodies to mitigate side effects and manage overdose risks introduces new therapeutic possibilities, potentially helping to address the opioid crisis in the United States, which is also posing a significant threat to Europe.
/web/2024/03-241010-72

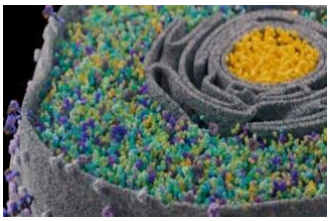
A Novel Approach to Combat Fatty Liver Disease

(EPFL, October 17, 2024)

Led by Johan Auwerx from EPFL and an international team, including partners from Cincinnati Children's Hospital, Amsterdam UMC, University of Lausanne, OrsoBio, and Osaka University, has achieved a groundbreaking discovery in the treatment of fatty liver disease. The team found that inhibiting an enzyme called ACMSD can effectively correct fibrosis, inflammation, and DNA damage in Metabolic dysfunction-associated steatotic liver disease, or "non-alcoholic fatty liver disease," marking a significant leap forward in combating this condition. Utilizing a multidisciplinary approach, researchers identified the ACMSD enzyme as a promising target for drug development, addressing a crucial need for new treatment options.
/web/2024/03-241017-e5

Protein Interaction Analysis with LiP Mass Spectrometry

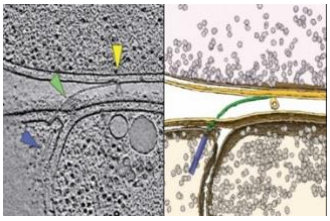
(ETH Zurich, October 18, 2024)



Biochemists at ETH Zurich, under the guidance of Professor Paola Picotti, have advanced LiP mass spectrometry to effectively analyze the protein interactome, which comprises the entire interaction network of proteins. The research team identified approximately 6,000 interaction interfaces, tracking changes in these sites when proteins interact under varying conditions. These findings serve as markers to assess protein interactions, offering profound implications for diagnosing diseases and understanding disease mechanisms. The versatility of the method allows its application in various organisms, paving the way for future studies to explore the interactome of human cells and analyze defective protein interactions. The research has already been implemented in practice by ETH spin-off Biognosys.
/web/2024/03-241018-d6

Catching Prey with Grappling Hooks and Cannons

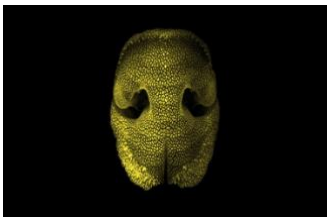
(ETH Zurich, October 22, 2024)



A groundbreaking study conducted by researchers from ETH Zurich, the University of Vienna, and led by Dr. Martin Pilhofer and Dr. Gregor Weiss from ETH Professor Roman Stocker's laboratory, has shed light on the fascinating predatory behavior of Aureispira bacteria. The team's research unveiled the intricate molecular structure and function of the bacteria's grappling hooks and cannons, known as contractile injection systems. Utilizing advanced imaging techniques such as light microscopy and cryo-electron microscopy, the study, conducted at ETH Zurich's ScopeM competence centre, provided insights into these bacteria's selectively predatory lifestyle and their ability to reconstruct their molecular weapons under certain dietary conditions.
/web/2024/03-241022-67

Geometric Mechanics Shape the Dog's Nose

(University of Geneva, October 23, 2024)



A study from the University of Geneva, led by Prof. Dr. Michel Milinkovitch has uncovered the geometric mechanics shaping the noses of dogs, ferrets, and cows. This research provides new insight into the evolution of developmental mechanisms, particularly focusing on the intricate polygonal structures found on the nose of these animals. The study involved collaboration with Université Paris-Saclay, the École nationale vétérinaire d'Alfort - EnvA, and the Institute of Neurosciences de San Juan de Alicante, where researchers collected rhinarium samples from dog, cow, and ferret embryos. Using advanced "light sheet fluorescence microscopy," they visualized biological structures in three dimensions.
/web/2024/03-241023-28

New Insights into How Bacteria Survive Antibiotics

(University of Basel, October 24, 2024)

Researchers at the University of Basel, led by Prof. Dr. Urs Jenal, have achieved a breakthrough in understanding how the bacterium Pseudomonas aeruginosa can survive antibiotic treatment using a toxin-antitoxin system. This discovery sheds light on how these bacteria enter a dormant state, contributing to their ability to cause recurrent infections. Utilizing human lung models, the team investigated how this toxin-antitoxin system contributes to the formation of persisters — bacteria that evade antibiotics by not actively growing. They discovered mutations in this system that increase persisters in bacteria from chronic pneumonia patients.
/web/2024/03-241024-73

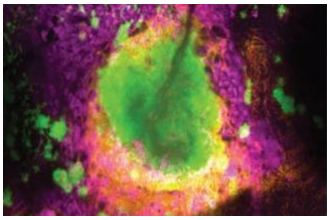
Innovation in Therapy for Macular Degeneration

(University of Fribourg, October 26, 2024)

Researchers from the University of Fribourg and the Center for Biological Research Margarita Salas in Spain, led by Professor Patricia Boya, have achieved a significant breakthrough in age-related macular degeneration (AMD) research. They discovered that the natural compound urolithin A can alleviate degeneration and preserve visual function in mice suffering from AMD. The study showed that urolithin A helps clear damaged cells by promoting a process called p62-dependent lysophagy, which protects against sudden retinal nerve damage. This is particularly significant as AMD is the leading cause of blindness among seniors and is projected to affect twice as many people by 2040.
/web/2024/03-241026-ae

Pathogen's Resistance Drops When Colonizing Airways

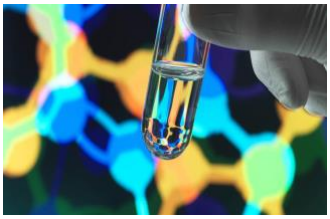
(EPFL, October 30, 2024)



Professor Alexandre Persat and lead author Dr. Lucas A. Meirelles spear-headed an innovative study investigating the lung pathogen Pseudomonas aeruginosa. Their research made a significant breakthrough by uncovering a fitness trade-off between the pathogen's ability to colonize mucosal surfaces and its resistance to antibiotics during airway infections. The team used cutting-edge tissue-engineering techniques to mimic the airway environment in the laboratory, allowing them to observe the pathogen's behavior using models that replicate human tissue physiology. This study holds great importance as it paves the way for developing new strategies to disrupt biofilm formation, potentially making the bacteria more susceptible to existing antibiotics. Given the growing global challenge of antibiotic resistance, understanding pathogens like P. aeruginosa is crucial for designing effective treatments.
/web/2024/03-241030-07

A New Way of Detecting Mutations Linked to Cancer

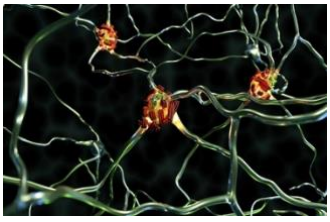
(University of Fribourg, October 31, 2024)



Researchers at the University of Fribourg, led by Professor Curzio Ruegg, have achieved a significant breakthrough in cancer detection. They have developed ultrasensitive nanosensors capable of identifying cancer-associated nucleic acids and mutations, marking a major leap forward in medical diagnostics. Utilizing Primer Exchange Reaction-Based Signal Amplification and Flow Cytometry, this method enables rapid, simple, and cost-effective detection of cancer mutations in tumor tissues and blood samples. The research holds great promise for enhancing cancer detection accessibility for numerous patients. Sarah Cattin and Isabelle Gray contributed significantly to this cutting-edge study.
/web/2024/03-241031-63

Decoding Alzheimer's Protein Structures

(EMPA, October 31, 2024)



Empa researcher Dr. Peter Nirmalraj, alongside scientists from the University of Limerick, has made a remarkable breakthrough in Alzheimer's research. Their innovative study has shed light on the process of protein fibril formation, classifying them into subpopulations like "superspreader" based on their surface structures. This research is crucial as it advances our understanding of protein spread in Alzheimer's disease, potentially leading to new monitoring and diagnostic methods. Employing a high-resolution atomic force microscope, the team observed fibril formation with unparalleled precision in real-time.
/web/2024/03-241031-c4

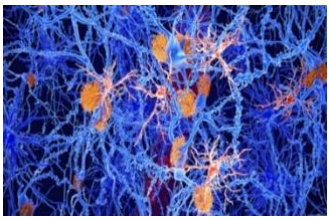
Similarities in Brain Development Between Marmosets and Humans

(University of Zurich, October 31, 2024)

A team of international researchers, led by Dr. Paola Cerrito from the University of Zurich, has made a significant breakthrough in understanding the brain development of common marmosets and its relation to their socio-cognitive skills and prosocial behavior. This study sheds light on how prolonged brain development in socially interactive regions equipped marmosets with sophisticated social abilities. The research used magnetic resonance data to analyze brain development, revealing that certain regions associated with social interaction develop over an extended period.
/web/2024/03-241031-4e

New Criteria to Prevent Alzheimer's Over-diagnosis

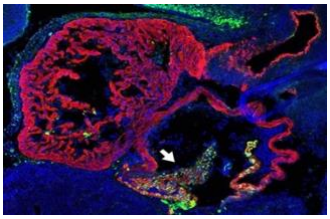
(University of Geneva, November 06, 2024)



A study led by Prof. Dr. Giovanni Frisoni at the University of Geneva, in collaboration with Prof. Dr. Bruno Dubois at Sorbonne University, has introduced new criteria to address over-diagnosis of Alzheimer's Disease (AD). This pivotal research aims to prevent healthy people from being mislabeled with AD due to reliance solely on laboratory examinations. The team proposed a comprehensive approach involving biomarkers, interdisciplinary medical consultations, and memory assessments for precise AD diagnosis. Conducted through longitudinal studies and including asymptomatic individuals in clinical trials, this approach quantified the weight of each risk factor more accurately. The significance of this study is highlighted by its potential to avoid misdiagnosis and develop personalized treatments designed according to an individual's lifestyle and nutritional needs, making advancements in the management and treatment of Alzheimer's Disease.
/web/2024/03-241106-f4

"Gene Desert" Regulates Embryonic Development and Cardiac Function

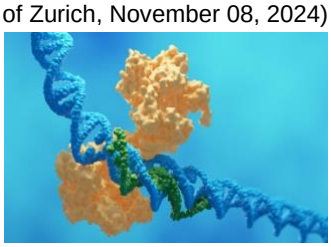
(University of Bern, November 07, 2024)



Researchers at the University of Bern, led by Prof. Dr. Marco Osterwalder, in collaboration with University Hospital Bern (Inselspital Stiftung), have identified a "gene desert" that significantly regulates embryonic development and cardiac function. The findings could have profound implications for genetic diagnostics and personalized medicine, potentially aiding in the detection of mutations in gene deserts that can signal risks for birth defects or heart diseases like arrhythmias.
/web/2024/03-241107-f4

Use of Genetic Scissors Carries Risks

(University of Zurich, November 08, 2024)



A team from the ImmuGene program at the University of Zurich, led by Professor Janine Reichenbach, has made significant strides in correcting genetic defects responsible for chronic granulomatous disease, a rare hereditary disease that affects about one in 120,000 people, using CRISPR technology. The team successfully employed the CRISPR system to insert missing letters into the DNA sequence of the NCF1 gene, crucial for addressing this rare disease. Despite promising outcomes, they observed new defects in some repaired cells, where entire sections of the chromosome went missing post-repair. This underscores both the potential and challenges of CRISPR-based therapies.
/web/2024/03-241108-75

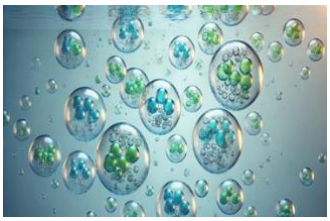
Unraveling the Link Between Hepatitis and Kidney Damage

(University of Zurich, November 08, 2024)

Researchers at the University of Zurich and the University Hospital Zurich, led by Prof. Dr. Achim Weber, have made a discovery linking hepatitis E to kidney damage. This insight was gained through meticulous analysis of patient tissue samples by renal pathology specialists Dr. Birgit Helmchen and Dr. Ariana Gaspert, with the support of molecular biologist Dr. Anne-Laure Leblond and collaborators from France and various Swiss hospitals. The research reveals that hepatitis E-infected liver cells produce excess viral protein that binds with other viral proteins and deposits in the kidneys, causing glomerulonephritis, a pattern of damage that in the worst case can lead to kidney failure. This understanding is crucial for improving hepatitis E diagnostics and treatments.
/web/2024/03-241108-5c

Emulating Natural Cell Communication with Synthetic Cells

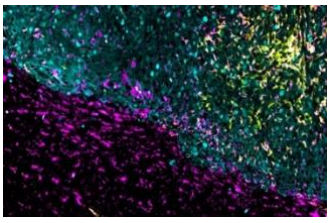
(University of Basel, November 13, 2024)



A pioneering research collaboration led by Prof. Dr. Cornelia Palivan at the University of Basel, along with Nobel laureate Prof. Dr. Ben Feringa from the University of Groningen, has emulated natural cell communication using synthetic cells. By developing tiny polymer-based containers, the team has created a new method of targeted molecular release, opening a new frontier in cell communication research. The researchers employed these containers for precise communication between synthetic cells, activated by light pulses. This innovative system allows a sender cell to release a molecule that travels to a receiver cell, which then transforms it into a fluorescence signal via enzymes in artificial organelles.
/web/2024/03-241113-80

Glioblastoma: New Treatment Attacks Brain Tumors from Multiple Angles

(University of Basel, November 13, 2024)



A breakthrough in cancer treatment has been achieved by Prof. Dr. Gregor Hutter and his team from the University of Basel and the University Hospital Basel. They've engineered CAR T-cells, designed to identify and destroy cancer cells in glioblastoma brain tumors. This research bypasses a significant challenge: getting T-cells to reach tumors. By injecting these lab-reprogrammed T-cells directly into the tumor, they effectively overcome this barrier. The T-cells are equipped with a special molecule that blocks the tumor's attempts to manipulate immune cells. Initial tests in mice demonstrated promising results, successfully eradicating cancer cells in both glioblastoma and lymphoma.
/web/2024/03-241113-79

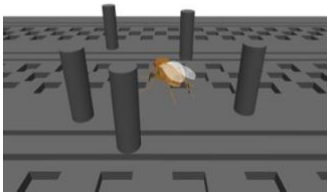
Advancements in Monitoring Diabetes During Pregnancy

(University of Geneva, November 13, 2024)

Researchers from the University of Geneva, Lausanne university hospital, and Geneva University Hospitals have made a significant breakthrough in our understanding of gestational diabetes. Led by Prof Dr. Tinh-Hai Collet, Prof. Dr. Jardena Puder, and Prof. Dr. Charna Dibner, the team used cutting-edge wearable devices for continuous monitoring. Their study involved tracking blood glucose levels, dietary habits, physical activity, sleep, and heart rate in participants, both with and without gestational diabetes. By integrating continuous glucose monitoring with a smartphone food diary app, the researchers gathered crucial insights into glucose dynamics post-meals.
/web/2024/03-241113-4a

Simulating how Fruit Flies See, Smell, and Navigate

(EPFL, November 15, 2024)



Sibo Wang-Chen and a team of researchers at EPFL, under the guidance of Prof. Dr. Pavan Ramdya, have created a groundbreaking digital model named NeuroMechFly v2. This innovative model simulates the intricate sensory and motor functions of fruit flies, offering unprecedented insights into how its brain integrates sensory signals for movement and state awareness. The development process involved capturing neural activities and combining them with precise anatomical and physiological details to create an accurate digital twin of the fruit fly. This allows scientists to simulate various behaviors, such as how the fly navigates its environment or engages in courtship.
/web/2024/03-241115-91

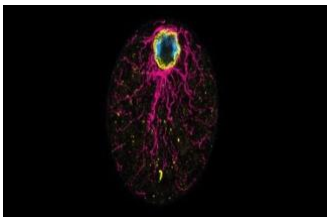
Using CRISPR to Decipher whether Gene Variants Lead to Cancer

(ETH Zurich, November 15, 2024)

A study carried out by researchers at ETH Zurich, in collaboration with Massachusetts Institute of Technology and Harvard University, marks a significant stride in cancer research. Led by ETH Professor Randall Platt, with Dr. Olivier Belli, as the first author, the team concentrated on generating cells with diverse gene variants of the EGFR gene, pivotal in cancer development. Utilizing two innovative CRISPR-Cas methods, base editing and prime editing, they modified the EGFR gene in over 50,000 unique ways. This vast array of cell variants enabled a thorough analysis of their functions, identifying variants that drive cancer progression and those that confer drug resistance.
/web/2024/03-241115-e3

The Chicken or the Egg: Ancient Unicellular Says Egg

(University of Geneva, November 15, 2024)



A study led by Dr. Marine Olivetta from the University of Geneva on ancient unicellular organisms uncovered insights into the origins of multicellularity. The study identified that the genetic programs governing complex multicellular development were present over a billion years ago, as evidenced by the species C. perkinsii. Through an extensive genetic and developmental analysis of C. perkinsii, the research revealed mechanisms of multicellular development similar to animal embryos, which casts new light on ancient embryo-like fossils. This discovery could challenge and redefine traditional views on the origins of multicellularity.
/web/2024/03-241115-11

Cause of the Yo-Yo Effect in Weight Loss Deciphered

(ETH Zurich, November 19, 2024)

A study by researchers from ETH Zurich, Karolinska Institutet in Stockholm, and hospitals in Leipzig, Dresden, and Karlsruhe, led by Dr. Laura Hinte and Prof. Dr. Ferdinand von Meyenn, has successfully deciphered the underlying cause of the yo-yo effect in weight loss. The team conducted an in-depth analysis of gene expression and epigenetic markers in fat cells, demonstrating how environmental factors and obesity can influence these markers over an individual's lifetime. This study is crucial as it not only explains the phenomena behind the yo-yo effect but also underscores the importance of early obesity prevention. Furthermore, the research highlights the enduring impact of fat cell memory and opens the door to potential future drug interventions aimed at erasing epigenetic memory, offering hope for more effective weight management strategies.
/web/2024/03-241119-40

A New Model to Understand Skin Renewal

(University of Geneva, November 19, 2024)

A breakthrough study from the University of Geneva could significantly advance our understanding of skin renewal processes. First author Dr. Alejandro Díaz Barreiro and Associate Professor Dr. Gaby Palmer have, for the first time, detected Interleukin-38 (IL-38) in the form of condensates within keratinocytes, the primary cells of the epidermis. This presence is much more pronounced near the skin's surface exposed to atmospheric oxygen, hinting at a potential role in triggering programmed keratinocyte death, a vital aspect of skin homeostasis. This novel behavior of interleukin 38 was previously unknown, and holds promise for therapeutic advancements in treating epidermal conditions.
/web/2024/03-241119-e0

Brain Stimulation Effectiveness Tied to Learning Ability, Not Age

(EPFL, November 28, 2024)

A study led by Prof. Dr. Friedhelm Hummel from EPFL, in collaboration with Dr. Pablo Maceira Elvira and teams from the University of Geneva, University of Applied Sciences Western Switzerland (HES-SO), and the NIH National Institute of Neurological Disorders and Stroke, uncovers that the effectiveness of brain stimulation is more closely linked to an individual's learning capability rather than their age. The researchers conducted the study by examining how native learning abilities affect the impact of brain stimulation during a motor task learning process. They discovered that individuals with less efficient learning mechanisms gain more from stimulation, while those with optimal learning strategies may experience adverse effects. This pivotal finding indicates the potential for developing tailored brain stimulation protocols that maximize individual benefits, enabling enhanced interventions in neurorehabilitation, where relearning lost skills is vital.
/web/2024/03-241128-3a

4. Nano / Micro Technology / Material Science

New Approach to Skin Disease Treatment

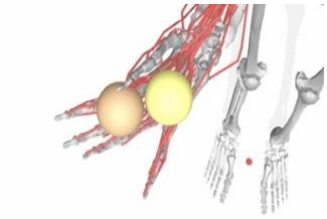
(EMPA, October 03, 2024)

In collaboration with Empa and industry partner Aldena Therapeutics, lead researchers Dr. Michael Stuer from the High Performance Ceramics laboratory and Dr. Patrick Hoffmann from the Advanced Materials Processing laboratory have made a groundbreaking advancement in the treatment of common skin diseases. Their work has led to the creation of nanoceramic stars that have the ability to temporarily open the skin barrier, facilitating the delivery of therapeutically active molecules, such as siRNA, directly to their target site. Utilizing aluminum oxide particles, the team engineered three-dimensional, sharp-edged nanoceramics capable of creating micro-wounds in the skin that rapidly self-heal. This innovative approach not only ensures effective delivery of active ingredients but also offers a cost-effective and sustainable method to treat chronic skin conditions like psoriasis and atopic dermatitis. Funded by Innosuisse, this research holds tremendous potential for improving current therapies and expanding treatment possibilities.
/web/2024/04-241003-a0

5. Information & Communications Technology

Modeling the Minutia of Motor Manipulation with AI

(EPFL, October 02, 2024)



Graduate students from the University of Geneva and EPFL, under the guidance of Prof. Dr. Alexandre Pouget and Prof. Dr. Alexander Mathis, have developed a new AI model of hand movements. Led by Alberto Chiappa, this model achieved a 100% success rate in a competition, demonstrating its remarkable ability to control hand movements with astounding precision. The model's success stems from a curriculum-based reinforcement learning approach, which breaks down complex tasks into smaller, manageable parts using curriculum learning. By recognizing and using basic movement patterns known as motor primitives, this AI provides significant insights into how the brain masters new tasks.
/web/2024/05-241002-e5

An AI Model for Sustainable Aircraft Design

(EPFL, October 04, 2024)

Researchers at EPFL, led by Prof. Dr. Pascal Fua, have developed a deep learning model that promises to transform sustainable aircraft design. With his expertise in machine learning and computer vision, Professor Fua is pioneering efforts in sustainable flying through the creation of DeepGEO, a novel deep geometric mapping technique. This breakthrough significantly simplifies the aerodynamic shape optimization process, minimizing manual efforts and reducing trial and error. Utilizing deep geometric learning techniques, the team conducted their research without the need for vast training datasets.
/web/2024/05-241004-cd

Bringing Swiss AI Research to the International Forefront

(EPFL, October 04, 2024)

ETH Zurich and EPFL have announced an enhanced collaboration to boost AI performance across Switzerland. They are launching the Swiss National AI Institute (SNAI), that will focus on developing large-scale AI foundation models that promise reliable functionality in essential areas such as healthcare, sustainability, and education. Equipped with an impressive computing power of 10,000,000 GPU hours to develop large scale AI foundation models, the SNAI aims to solidify Switzerland's position as a hub for inclusive and trustworthy AI research and applications.
/web/2024/05-241004-03

New Benchmark Helps Solve the Hardest Quantum Problems

(EPFL, October 24, 2024)

A team of researchers, led by Dr. Giuseppe Carleo from EPFL, along with contributors from institutions including Sorbonne Université, University of Zurich, The University of Tokyo and Keio University, have introduced a new tool called the V-score. This benchmark sets a new standard in measuring advancements in solving complex quantum problems. The development of the V-score was supported by funding from the Swiss National Science Foundation, Simons Foundation, and the European Union's Horizon 2020 program. The research focuses on quantum many-body problems, creating a reliable benchmark to evaluate quantum algorithms and classical methods.
/web/2024/05-241024-c2

A Benchmark to Check AI Compliance

(ETH Zurich, October 24, 2024)

LatticeFlow AI, a spin-off from ETH Zurich, in collaboration with Robin Staab, a doctoral student in Prof. Dr. Martin Vechev's research group, has made groundbreaking strides in AI compliance. Their work provides the first comprehensive technical interpretation of the EU AI Act for General Purpose AI (GPAI) models. The team tested their approach on twelve popular generative AI models, developing an innovative "compliance checker," a benchmark set for assessing AI model compliance with anticipated EU AI Act requirements. This translation of legal prerequisites into concrete, measurable standards is crucial for ethical AI development, tackling issues like privacy, transparency, and fairness.
/web/2024/05-241024-c8

AI Helps to Detect Antibiotic Resistance

(University of Zurich, October 25, 2024)

Scientists at the University of Zurich, under the guidance of Prof. Dr. Adrian Egli, have achieved a significant advancement in detecting antibiotic resistance with the aid of artificial intelligence. The team employed the GPT-4 AI model, developed by OpenAI, to enhance the analysis of antibiotic resistance in bacteria. The researchers used the Kirby-Bauer disk diffusion test, which measures how well antibiotics stop bacteria from growing, and developed an AI tool for interpreting antimicrobial resistance mechanisms named the "EUCAST-GPT-expert" system. This AI tool promises a standardized approach to complex diagnostic tests, minimizing variability and subjectivity inherent in manual readings.
/web/2024/05-241025-22

New Supercomputer Enables Cutting-edge and Sustainable Research

(EPFL, November 21, 2024)

EPFL, in partnership with Lenovo, has unveiled a groundbreaking super-computer named Kuma. The initiative, led by Dr. Gilles Fourestey, head of operations at SCITAS, and Assistant Professor Dr. Michele Ceriotti, director of the scientific steering committee, introduces powerful processors that could significantly enhance innovation across various fields, including healthcare, climate research, and materials science. Kuma's design is not only a leap forward in computing power but also emphasizes sustainability: Utilizing EPFL's new heating plant, the supercomputer is cooled by water drawn from Lake Geneva, efficiently heating the campus in return.
/web/2024/05-241121-e9

User Language Distorts ChatGPT Information on Armed Conflicts

(University of Zurich, November 28, 2024)

At the University of Zurich, researcher Dr. Christoph Steinert, alongside physicist Daniel Kazenwadel from the University of Konstanz, Germany, has spearheaded an study on large language models (LLMs) like ChatGPT, which uncovered how the language used for prompting impacts the responses generated by these models. Using an automated query system, the researchers posed identical questions in various languages to ChatGPT, focusing particularly on contentious topics such as the Israeli-Palestinian and Turkish-Kurdish conflicts. Their analysis revealed a stark disparity; specific languages can sway the model's answers, such as denying airstrikes when questions are posed in the language of the attacker.
/web/2024/05-241128-15

6. Energy / Environment

Scientists Explore the Complexity of Rocks within the Earth's Crust

(EPFL, October 09, 2024)

Researchers from EPFL, led by Dr. Gabriel Meyer at the Laboratory of Experimental Rock Mechanics (LEMR) under the guidance of Prof. Marie Violay, have achieved a noteworthy breakthrough in understanding the complex nature of rocks deep within the Earth's crust. Their pioneering work focuses on geothermal reservoirs and reveals how rocks situated between five and eight kilometers underground are permeable to fluids. Through an innovative combination of computer simulations and laboratory experiments, the team demonstrated that rocks situated between five and eight kilometers below the Earth's surface are permeable to fluids.
/web/2024/06-241009-06

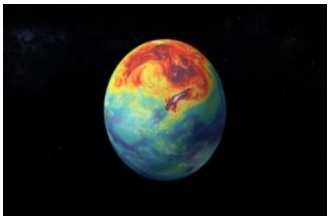
Teflon Factory Emissions Under Scrutiny: New Methodology Exposes Significant Gaps

(EMPA, October 10, 2024)

Researchers from Empa, the University of Bristol, and the Netherlands Organization for Applied Scientific Research (TNO), led by Dr. Dominique Rust, have made a significant breakthrough in their recent study published in Nature. This research focused on HFC-23 emissions from a Teflon factory in the Netherlands, aiming to resolve discrepancies between reported and actual global emissions of this potent greenhouse gas. Their pioneering methodology, which utilized a tracer gas to achieve precise measurements, revealed a significant disparity between reported and actual HFC-23 emissions.
/web/2024/06-241010-4d

Catastrophically Warm Predictions Are More Plausible than We Thought

(EPFL, October 15, 2024)



Researchers at EPFL, in collaboration with the Foundation for Research and Technology Hellas, have developed a new rating system to assess the plausibility of climate model simulations, focusing on those included in the IPCC's latest report. The research involved an extensive analysis of big data sourced from observational networks and satellite deployments, enabling a systematic observation of the planet's climate variables. The results underscore the importance of acknowledging models that predict potentially catastrophic warming, emphasizing the urgency of addressing carbon emissions.
/web/2024/06-241015-a0

Plant Diversity Enhances Soil Carbon Retention

(University of Zurich, October 25, 2024)

A groundbreaking study led by Luiz Domeignoz-Horta at the University of Zurich has revealed that increasing plant diversity in agricultural practices can significantly boost soil carbon retention. Conducted at the TwinWin experiment site in Finland, this research focused on the impact of diverse plant species on soil health. Barley was grown either alone or with up to eight different plant species, allowing researchers to measure microbial carbon use efficiency and analyze microbial dynamics. They used molecular sequencing and stable isotope tracking to trace carbon movement through soil microbes.
/web/2024/06-241025-91

Examining Aerosols for Solar Geoengineering

(ETH Zurich, October 30, 2024)

A team of researchers at ETH Zurich, led by Dr. Sandro Vattioni, has conducted a pioneering study on solar geoengineering which focused on using aerosols in the upper atmosphere to reflect solar radiation. This research is crucial in understanding future climate change mitigation strategies, and could potentially slow down global warming. The study analyzed various aerosols to determine which could most effectively reflect solar radiation. It highlighted synthetic diamond dust as a potential choice; however, its production is costly and requires significant energy. Moreover, the investigation underscores the uncertainties and ethical dilemmas linked to solar geoengineering. This research is vital as it underscores both the promise and challenges of these techniques.
/web/2024/06-241030-58

Human Impact on Fish Habitats Detected with AI

(University of Bern, November 05, 2024)

Dr. Conor Waldock and Prof. Dr. Ole. Seehausen from the University of Bern and Eawag have conducted a study on the impact of human activities on fish habitats using artificial intelligence. This research stands out by distinguishing human impacts from natural factors, offering invaluable insights for species conservation in river ecosystems. The study collected comprehensive data on the populations of nine fish species throughout the Aare-Rhine catchment. By using a machine learning approach, the team linked this data with various environmental factors. Their findings not only highlight vital conservation locations but also reveal potential habitats, termed "shadow distributions," where species could thrive. This understanding is crucial for targeted biodiversity conservation efforts.
/web/2024/06-241105-63

Scientists Quantify Aerosols Based on Sea State

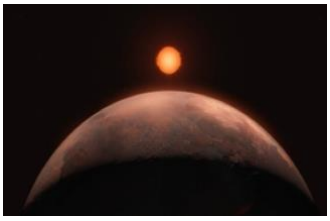
(EPFL, November 28, 2024)

EPFL scientists, led by Assistant Professor Dr. Julia Schmale have developed a system that unravels the intricate relationship between sea spray aerosols, sea state, and atmospheric conditions. This breakthrough offers crucial insights into the environmental processes at play in the Arctic, focusing on summer conditions. The team conducted their research by mounting this innovative system on an icebreaker, which traversed expansive Arctic regions, collecting valuable data. The collaboration included experts from the University of East Anglia, ETH Zurich, University of Venice, and the University of Melbourne. The research identifies physical variables like sea state, wind speed, and atmospheric stability affecting aerosol production. Understanding these dynamics is vital, as aerosols significantly influence cloud formation, precipitation, and the planetary energy balance, ultimately enhancing climate change predictions and advancing weather forecasting.
/web/2024/06-241128-0b

7. Engineering / Robotics / Space

Discovery of a New Sub-Earth Planet

(University of Bern, October 04, 2024)



A team from the University of Bern, led by Prof. Dr. Yann Alibert, in collaboration with Dr. João Pedro Bernardes Faria and Dr. Melissa Hobson from the University of Geneva, has made an extraordinary scientific breakthrough. They detected a sub-Earth planet, named Barnard b, orbiting the nearby star Barnard, using high-precision instruments largely developed at Swiss universities. The research employed the ESPRESSO spectrograph to measure star velocities with an accuracy of just a few 10 cm/s, allowing for this remarkable discovery. Such advancements are crucial in the quest to study exoplanets, particularly when searching for potentially habitable planets.
/web/2024/07-241004-59

Revolutionary Assistive Technologies to Help People Overcome Everyday Barriers

(ETH Zurich, October 04, 2024)

Researchers from ETH Zurich, ZHAW, led by Prof. Dr. Stanisa Raspopovic, have made groundbreaking strides in assistive technology. Their innovative work has led to the development of advanced tools for people with disabilities, including a smart belt and four-legged robots designed to aid in daily tasks. This research involved creating cutting-edge systems like peripheral nerve stimulation and assistive robots, which show great promise in enhancing the everyday experiences of those with disabilities. The importance of this work lies in its potential to simplify and significantly improve the quality of life for many.
/web/2024/07-241004-3d

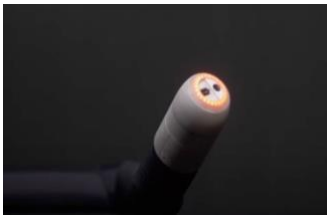
Record-breaking Ultra-short Laser Pulses

(ETH Zurich, October 15, 2024)

Led by Prof. Dr. Ursula Keller from the Institute for Quantum Electronics, researchers at ETH Zurich have achieved a significant breakthrough in the production of ultra-short and powerful laser pulses. This advancement is attributed to an optimized arrangement of mirrors within the laser and enhancements to a special mirror that triggers pulse emission. The new laser system can produce extraordinarily short pulses with peak powers reaching up to 100 megawatts and an average power of 550 watts, exceeding previous limits by over 50 percent. This breakthrough is crucial for precision measurements, advanced materials processing, and creating high harmonic frequencies up to X-rays.
/web/2024/07-241015-09

The Snake that Saves Lives

(ETH Zurich, November 07, 2024)



A team of Engineers at ETH Zurich has developed a snake-like robot, named RoBoa, with remarkable flexibility and efficiency. Engineered to extend and slither into typically inaccessible spaces such as pipes, sewers, or disaster zones, RoBoa's design offers potential uses for inspection, search, and rescue operations. Crafted with a soft and pneumatic framework, RoBoa ensures safety in hazardous environments, mitigating the risk of explosion by avoiding sparks. It is also equipped with a speaker and microphone, facilitating direct communication with victims in emergencies.
/web/2024/07-241107-e9

Jet Engines for the Hydrogen Era

(ETH Zurich, November 08, 2024)

Researchers at ETH Zurich have achieved a groundbreaking advancement in jet engine technology, marking a pivotal step toward integrating hydrogen-powered solutions in aviation. This collaborative effort shines a light on innovative approaches to sustainable air travel. The research focused on analyzing the acoustic behavior of hydrogen injection nozzles under lab conditions that mimic cruising altitudes. This study sets the stage for crafting robust engines capable of powering the first generation of hydrogen-fueled aircraft, and its significance extends beyond academic circles, offering tangible benefits in reducing aviation's environmental footprint.
/web/2024/07-241108-db

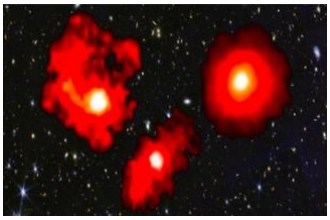
New Type of Weather Radiosonde Can Find Its Way Back

(EPFL, November 13, 2024)

Developed by Yohan Hadji, a master's student at EPFL, in collaboration with MeteoSwiss, a new type of weather radiosonde has been developed, that autonomously returns to a predetermined location, addressing the challenge where 80% of radiosondes worldwide go missing after deployment. The testing involved approximately 60 test flights across Switzerland, and included evaluations at the MeteoSwiss weather station in Payerne, aimed to assess system performance under diverse weather conditions, and has yielded promising results.
/web/2024/07-241113-96

Three Galactic “Red Monsters” in the Early Universe

(University of Geneva, November 15, 2024)



An international team led by the University of Geneva and collaborating with NASA's James Webb Space Telescope (JWST) has made an exciting discovery: under the guidance of lead researcher Dr. Pascal Oesch, they have unveiled the existence of massive galaxies in the early universe that built stars far more efficiently than previously thought. Utilizing NIRCam/grism spectroscopy aboard the JWST, the research team could study the growth of galaxies over time, reshaping existing galaxy formation models. This breakthrough provides new insights into how stellar mass accumulated over cosmic history.
/web/2024/07-241115-37

Einstein’s Equations Collide with the Mysteries of the Universe

(University of Geneva, November 15, 2024)

Researchers from the University of Geneva led by researcher Dr. Nastassia Grimm, have achieved a significant milestone in astrophysics. They are pioneering efforts to test the validity of Einstein's equations at vast cosmic scales. Using data from the Euclid space telescope, which will observe about 1.5 billion galaxies over six years, the team is set to perform precision measurements of space-time distortions. This endeavor will enable scientists to look further back in time, testing the fabric of Einstein’s foundational equations. The research holds profound importance as it may either challenge or confirm fundamental physics principles, shedding new light on our understanding of the Universe's structure.
/web/2024/07-241115-d6

Earliest Traces of Water on Mars Believed to Date Back 4.45 Billion Years

(University of Lausanne, November 27, 2024)

A team of researchers from Curtin University, the University of Lausanne, and the University of Adelaide, led by Jack Gillespie, has made a groundbreaking discovery regarding the ancient presence of water on Mars. Their research provides compelling evidence that hydrothermal activity occurred on Mars over 4.45 billion years ago. Through meticulous analysis of the Martian meteorite NWA 7034, dubbed "Black Beauty," found in the Sahara desert in 2011, the team focused on zircon minerals within the meteorite. This analysis revealed crucial insights into Mars' geological processes, highlighting the early presence of water and its potential habitability. Supported by the Australian Research Council, Curtin University, and the Swiss National Science Foundation, this discovery considerably enhances our understanding of Mars' early planetary evolution and hints at the possibility that the planet could have supported life.
/web/2024/07-241127-71

8. Physics / Chemistry / Math

A New Spectroscopy Reveals Water's Quantum Secrets

(EPFL, October 30, 2024)

Dr. Sylvie Roke and her team from EPFL have developed the correlated vibrational spectroscopy (CVS) method, a pioneering technique that allows for the direct measurement of hydrogen-bond networks within water molecules. This innovative method utilizes femtosecond laser pulses in the near-infrared spectrum to differentiate between interacting and non-interacting molecules within the H-bond network. This advancement is crucial as it enables the quantification of hydrogen-bonding strength and offers molecular-level insights into various solutions. This method's potential applications are vast, including studies in electrolytes, sugars, amino acids, DNA, and proteins. Ultimately, it holds transformative possibilities for characterizing interactions across any material, promising significant strides in multiple scientific fields.
/web/2024/08-241030-7d

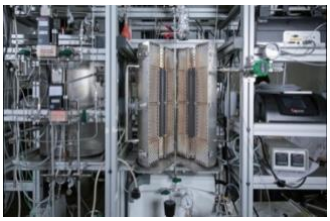
Fundamental Quantum Model Recreated from Nanographene

(EMPA, October 31, 2024)

Researchers at Empa, led by Prof. Dr. Roman Fasel, with contributions from Dresden University of Technology and the International Iberian Nanotechnology Laboratory in Portugal, have made an exciting breakthrough in applied quantum physics. They successfully recreated a well-known theoretical quantum physics model in a synthetic material using nanographenes. This study is a landmark achievement as it demonstrates the potential to create and study exotic quantum states in synthetic materials. Such advancements hold promising applications in fields like communication, computing, and sensor technology.
/web/2024/08-241031-77

Breakthrough in Sustainable Chemical Catalysts

(EPFL, October 31, 2024)



Researchers at EPFL, led by Associate Professor Jeremy Luterbacher, have achieved a significant breakthrough in catalyst development. They unveiled a novel method for precise layering of metal clusters on solid supports, which has the potential to enhance catalytic activity and contribute to sustainable chemical production. This research utilized a technique known as liquid-phase atomic layer deposition (ALD) to create exact catalyst active sites that facilitate reactions. The deposition of small metal clusters with near atomic precision significantly increased the rate of carbon dioxide hydrogenation, enabling the conversion of CO2 into valuable chemicals such as methanol. These advancements could accelerate chemical reactions and have substantial implications for more sustainable practices within the chemical industry.
/web/2024/08-241031-e6

How Personal Care Products Affect Indoor Air Quality

(EPFL, November 10, 2024)

A study from EPFL, led by Assistant Professor Dusan Licina, has revealed how personal care products can significantly affect indoor air quality. The research identifies that these products release volatile organic compounds, which undergo oxidation and lead to new particle formation, impacting respiratory health. The study involved simulating the usage of personal care products within controlled environmental chambers to closely examine their effects in indoor settings. This research underscores the need for greater awareness and mitigation strategies, particularly for vulnerable populations like children and the elderly.
/web/2024/08-241110-f9

How Catalysts Remove Dangerous Nitrogen Oxides

(Paul Scherrer Institute, November 10, 2024)

A team of researchers at the Paul Scherrer Institute, including Dr. Davide Ferri and Dr. Filippo Buttignol, has made significant strides in understanding how zeolite-based catalysts effectively remove toxic nitrogen oxides from industrial emissions. Their research highlights the importance of the nano porous structures within zeolites. Remarkably, they discovered that individual iron atoms in adjacent pores communicate to drive the desired reactions for transforming harmful nitrogen oxides into harmless molecules. The study used advanced spectroscopic techniques, including X-ray absorption spectroscopy, electron paramagnetic resonance spectroscopy, and infrared spectroscopy, to analyze how light interacts with samples. This research is pivotal for developing effective strategies to mitigate nitrogen oxides, addressing a major environmental challenge. Their findings could help enhance future catalyst designs, which are pivotal towards improving environmental and human safety from industrial emissions.
/web/2024/08-241110-41

9. Architecture / Design

The Future of Zero-Carbon Buildings

(EPFL, October 25, 2024)

Led by Prof. Dr. Marilyne Andersen, researchers at EPFL have pioneered a new approach to urban architecture, creating buildings that offer enhanced, personalized comfort while achieving zero carbon emissions. This innovative breakthrough is facilitated by cutting-edge advances in sensors and artificial intelligence. The research emphasizes the impact of urban design on energy savings, particularly in Switzerland's city centers. By reconciling individual well-being with essential behavior change, this project addresses the construction industry's significant greenhouse gas emissions. The findings are pivotal in steering the industry towards sustainable practices, minimizing ecological impact, and combating climate change. Additionally, the study's open-access nature ensures broad dissemination and application of these insights, fostering global ecological architecture advancements.
/web/2024/09-241025-d2

Transforming the Construction Industry for Future Generations

(EPFL, November 22, 2024)

Buildings play a pivotal role in accommodating our growing global population sustainably, with renovation and energy efficiency emerging as critical priorities over new construction. Professor Philippe Thalmann's insights reveal how strategic improvements to existing structures can dramatically reduce the construction industry's environmental impact while meeting housing demands. The path to sustainable housing extends beyond technical solutions, encompassing complex economic and practical challenges. Key strategies include optimizing living spaces through reduced per-capita floor area, as recommended by the UN International Resource Panel. This comprehensive approach to housing transformation promises to slash carbon emissions while creating more equitable living solutions for future generations. The shift toward renovation-focused development represents a crucial step in achieving long-term housing sustainability.
/web/2024/09-241122-cf

10. Economy, Social Sciences & Humanities

Fair Pension Policies Based on Occupational Life Expectancy

(University of Fribourg, October 26, 2024)

Researchers from the University of Fribourg, led by Professor Volker Grossmann in collaboration with Dr. Johannes Schünemann and Professor Holger Strulik from The University of Göttingen, have conducted a study on fair pension policies. This research reveals the impact of life expectancy differences on pension systems, highlighting potential redistributive effects from lower-income to higher-income individuals under current policies. Using a sophisticated health and macroeconomic model, the study demonstrates that uniformly raising the statutory retirement age would disproportionately benefit wealthier individuals while significantly harming the welfare and life expectancy of blue-collar workers. To counteract this, the study recommends strong incentives for early retirement for blue-collar workers, emphasizing the positive effects of early retirement on their life expectancy. These findings advocate for pension policies that account for occupational life expectancy differences, ensuring fairer distributions of pension contributions and benefits.
/web/2024/10-241026-ce

Caregivers Experience Decline in Well-Being

(University of Zurich, November 28, 2024)

Researchers at the University of Zurich, led by Dr. Michael Krämer, have uncovered crucial insights into the well-being of caregivers. By analyzing an extensive dataset from the Netherlands, Germany, and Australia, comprising 281,884 observations from 28,663 caregivers, the study reveals significant declines in life satisfaction and emotional health, particularly heightened anxiety and loneliness, among caregivers, with women notably affected. The study's findings indicate that increased time dedicated to caregiving tasks leads to a deterioration in well-being, irrespective of gender. This comprehensive research emphasizes the urgent need for policy changes, suggesting reduced dependence on informal care and better access to formal long-term and blended care solutions.
/web/2024/10-241128-ea

The Role of Social Media in Shaping Obesity Perceptions

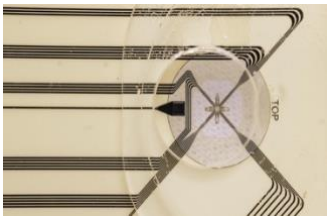
(University of Geneva, November 28, 2024)

Conducted at the University of Geneva and Geneva University Hospitals (HUG), this innovative research explores how social media influences public health messages, focusing specifically on obesity. Using a mix of human and AI analysis, researchers delved into sentiments surrounding obesity on Twitter. This involved advanced algorithmic and manual sentiment analysis across eight languages, providing a nuanced view of the digital landscape. The findings underscore the profound impact social media and public personalities have on shaping public health opinions and behaviors, which is critical for crafting effective public health policies and strategies that navigate the unique challenges posed by digital communication channels.
/web/2024/10-241128-a3

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

e-Flower Records Neuronal Activity with Electronic Petals

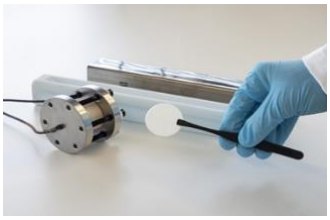
(EPFL, October 21, 2024)



Scientists at EPFL, led by Eleonora Martinelli, have developed a new soft electronic device called the "e-Flower." This innovative tool can record the activity of neural spheroids — 3D neuron clusters that replicate brain tissue functions. This cutting-edge research initially aimed to resolve challenges in soft implants for peripheral nerves. However, the e-Flower has emerged as a crucial tool for exploring 3D models of brain development and disorders, including brain organoids. By bridging the gap between simplified in vitro models and human brain complexities, this technology has transformative potential for neuroscience research and next-generation neurotechnology, offering a robust early-stage testing model for neural spheroids and aiming for more precise brain disorder modeling.
/web/2024/11-241021-dc

Advancing Salt Battery Technology for Sustainable Energy Storage

(EMPA, October 25, 2024)



Researchers Dr. Meike V. F. Heinz and Prof. Dr. Corsin Battaglia from Empa, in collaboration with the Swiss company HORIEN Salt Battery Solutions, are making strides in the development of salt batteries. Their focus on cell chemistry aims to reduce nickel content, enhancing both the sustainability and cost-efficiency of these batteries. The team is meticulously coordinating the composition and microstructure of the cells to ensure efficient and long-lasting performance. By examining the ceramic electrolyte and cell geometry, they aim to maximize the advantages of salt batteries over traditional lithium-ion counterparts, particularly in terms of safety and suitability for stationary power storage. Supported by the Swiss Federal Office of Energy SFOE, this research is crucial for offering sustainable battery solutions ideal for residential and industrial applications, minimizing reliance on critical raw materials and significantly extending service life.
/web/2024/11-241025-a2

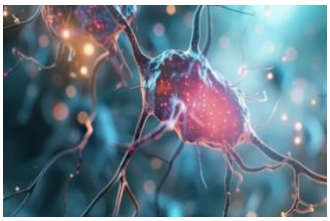
SightGuide: A Smart Vision Assistance for Wheelchairs

(ETH Zurich, October 25, 2024)

Researchers Dr. Reto Togni and Dr. Stefan Villiger from ETH Zurich have unveiled SightGuide, an innovative technology empowering wheelchair users to steer using a backrest. This breakthrough significantly cuts down the energy expenditure needed for movement, promising enhanced mobility and comfort. The development involved constructing multiple prototypes and conducting laboratory studies to verify the technology's biomechanical effectiveness. Over 50 wheelchair users have tested the backrest steering and praised its efficiency. This successful research has paved the way for a startup, Versive, focused on bringing this technology to the market. SightGuide's importance lies in its potential to transform the daily lives of wheelchair users, offering a more effortless, user-friendly mobility solution.
/web/2024/11-241025-31

On the Way to Light-controlled Medicine

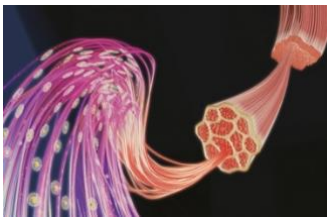
(Paul Scherrer Institute, October 25, 2024)



A groundbreaking advancement in light-controlled medicine has been achieved by researchers at the Paul Scherrer Institute (PSI) in collaboration with ETH Zurich and EPFL. Led by Oliver Tejero, Prof. Dr. Gebhard F. X. Schertler, Matthew Rodrigues, and Ching-Ju Tsai, the team has successfully elucidated the structure of specific photoreceptors, paving the way for controlling cellular activities using light. Their project, Switchable rhodOpsins in Life Sciences (SOL), has been recognized with a prestigious ERC grant. The research involved identifying a suitable rhodopsin and modifying it to remain stable in its active state for examination. This breakthrough could significantly enhance our understanding of organ functions and open up new therapeutic applications. PSI's commitment to innovation and education is evident, with a quarter of its staff dedicated to training future scientific leaders, aligning their priorities with cutting-edge research initiatives.
/web/2024/11-241025-88

Revolutionizing Tissue Engineering with Novel Scaffold Technology

(ETH Zurich, October 30, 2024)



Led by researcher Hao Liu of ETH Zurich, a groundbreaking technology has been developed that enables the production of aligned tissues such as muscle, tendon, nerve, and cartilage. This innovative approach uses delicate filament scaffolds, which guide cells to grow in precise alignments, marking a significant advancement in tissue engineering. The research demonstrates immense potential in applications like high-throughput drug screening and various medical research areas. Liu appreciates the academic freedom and engineering focus at ETH Zurich, having gained insights from research cultures in Japan and Switzerland. The team is actively working on making the technology accessible to other scientists and exploring commercial opportunities in supplying these tissue constructs for research and medical use, potentially transforming drug development processes.
/web/2024/11-241030-a8

Technology Transfer at Empa

(EMPA, November 11, 2024)

Technology transfer is crucial for bringing innovations out of the lab and into the wider world. At Empa, this involves direct collaboration with industry or founding spin-offs. Marlen Müller, Head of Knowledge and Technology Transfer at Empa, emphasizes that this collaboration is in Empa's DNA. The institute, from its foundation as a materials testing institute, has maintained strong ties with Swiss industry, leveraging its extensive materials science expertise. Empa's primary technology transfer channel is through industrial partnerships, with over 130 projects annually. These collaborations lead to products, patents, and new technologies, benefiting Swiss SMEs and large companies. Researchers retain the ability to publish results, an essential aspect for academic growth. As Switzerland ranks high in innovation, Müller notes that effective technology transfer is key to maintaining this status. Looking ahead, Empa aims to balance open source with intellectual property protection, adapting to evolving trends in research funding and innovation.
/web/2024/11-241111-3c

12. General Interest

New Approach to Reducing Rush-Hour Congestion

(EPFL, October 04, 2024)

Engineers at EPFL and ETH Zurich, led by Assistant Professor Kenan Zhang, have developed a system named CARMA to tackle rush-hour traffic in major cities. Their innovative system, CARMA, represents a fair and effective solution that redefines commuter patterns and holds the potential to greatly alleviate traffic congestion in major cities. CARMA operates by acknowledging that not all commuters are always in a rush to reach their destinations simultaneously. The system protects personal data and ensures equity amongst commuters, eliminating income-based disparities. This breakthrough is crucial as it realistically mirrors commuter behavior over the long run and could lead to significant time savings and reduced frustration for city dwellers.
/web/2024/12-241004-da

Climate Change Affects the Risk of Malaria in Kenya

(University of Basel, October 30, 2024)

In a collaborative study led by Dr. Bryan Nyawanda and Dr. Penelope Vounatsou at Swiss TPH, an important link has been established between climate change and an increase in malaria cases in northern Kenya. This research highlights how increased rainfall and temperatures are driving a surge in malaria rates within specific regions of the country. By analyzing malaria prevalence data alongside climate variability from 2015 to 2020, the researchers uncovered significant insights into how climate influences disease patterns. This study emphasizes the necessity for region-specific malaria strategies that consider local climatic conditions and urbanization impacts. Understanding this complex relationship is crucial for developing targeted interventions and ensuring protection for vulnerable populations in Kenya and similar regions affected by climate-induced health challenges.
/web/2024/12-241030-73

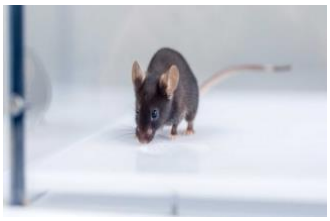
New Extinct Coelacanth Species Discovered

(University of Geneva, November 13, 2024)

Dr. Luigi Manuelli from the University of Geneva, in collaboration with Dr. Lionel Cavin from the Natural History Museum of Geneva, has discovered a new extinct species of coelacanth. Often referred to as a "living fossil," this finding offers exciting insights into the evolutionary history of these ancient fish. Using the advanced synchrotron technology at the European Synchrotron Radiation Facility in Grenoble, researchers produced "synchrotron light" X-rays to examine fossils preserved in rock. This technology enabled the creation of virtual 3D models, revealing details previously inaccessible. Supported by the Swiss National Science Foundation, this study involved countless hours of computer analysis to meticulously virtualize the fish skeletons, unveiling crucial data about coelacanth diversity and evolution.
/web/2024/12-241113-fd

Cutting-edge AI Methodology Enhances Stress Research

(ETH Zurich, November 18, 2024)



A pioneering method for analyzing mouse behavior has been developed by researchers at ETH Zurich, led by Prof. Dr. Johannes Bohacek, with Dr. Oliver Sturman as the lead author and Head of the 3R Hub at ETH. This breakthrough leverages artificial intelligence and machine learning to analyze behavioral flow in mice, offering a more precise and standardized approach to stress research and supporting animal welfare in biomedical studies. The research used advanced statistical techniques to identify subtle behavioral differences among mice and assess the effects of stress on brain mechanisms. This innovative approach is crucial for determining individual stress-handling capabilities, which can guide therapy options for human risk groups. Furthermore, by promoting the 3R principles (Replacement, Reduction, and Refinement), the method enhances laboratory animal conditions. The 3R Hub at ETH is committed to extending these methodologies to fellow researchers, optimizing ethical research standards globally.
/web/2024/12-241118-9f

Multiple Sclerosis Drug May Help with Poor Working Memory

(University of Basel, November 19, 2024)

Researchers from the University of Basel, led by Prof. Dr. Andreas Papassotiropoulos and Prof. Dr. Dominique de Quervain, have published promising findings on the potential of repurposing the drug fampridine to enhance working memory. This study targets disorders such as schizophrenia, depression, and ADHD, revealing exciting possibilities for cognitive enhancement therapies. The study involved testing fampridine on 43 healthy adults, focusing on its effects on working memory. Originally used to improve mobility in multiple sclerosis patients, fampridine's impact on cognitive performance and mental fatigue related to multiple sclerosis initiated this research. Selected through genome data analysis, the drug acts on specific nerve cell ion channels, indicating its potential in treating mental disorders. While results showed improvements, the drug's effectiveness may vary among individuals. Further research is planned to explore its application in mental health treatments.
/web/2024/12-241119-50

Shell Limits Evolution of Turtles

(University of Fribourg, November 21, 2024)

Researchers Guilherme Hermanson and Dr. Serjoscha Evers from the University of Fribourg have made a significant breakthrough in understanding how the turtle shell impacts species diversity. Their study delves into the relationship between body size and limb length in turtles and reveals how these constraints limit evolutionary potential. The research found that turtles' fixed body-limb proportion, or isometry, poses a major evolutionary hurdle, unlike other animals with flexible limb growth (allometry). By examining over 200 species, both living and extinct, they discovered that the shell-to-limb length ratio has remained largely unchanged for millions of years. However, slight variations in sea turtles showcase their adaptation to aquatic life. This comprehensive study, published in Ecology & Evolution, provides valuable insights into why turtles have limited species diversity compared to other animals.
/web/2024/12-241121-ca

"Genetic Time Machine" Reveals Complex Chimpanzee Cultures

(University of Zurich, November 22, 2024)

A multidisciplinary study spearheaded by the University of Zurich, with collaboration from universities and research institutions in Zurich, St. Andrews, Barcelona, Cambridge, Konstanz, and Vienna, has led to a discovery in the field of evolutionary anthropology. Led by Dr. Cassandra Gunasekaram from the University of Zurich, the team uncovered complex chimpanzee cultures that have evolved over thousands of years. Through extensive genetic analysis at 35 distinct chimpanzee study sites across Africa, the researchers found significant genetic links and cultural behaviors shared among different populations. This provides compelling evidence that chimpanzees, similar to humans, have cultural practices passed down through generations. These revelations offer groundbreaking insights into the early stages of cumulative culture in chimpanzees, challenging prior assumptions about non-human cultural evolution and emphasizing the importance of understanding our closest relatives' cultural behaviors in the animal kingdom.
/web/2024/12-241122-68

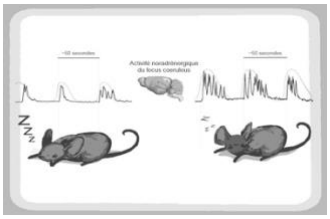
The Chilling Sound of the Aztec Death Whistle

(University of Zurich, November 22, 2024)

A groundbreaking study on ancient Aztec skull whistles, led by Prof. Dr. Sascha Frühholz from the University of Zurich in collaboration with the Ethnological Museum in Berlin, has unveiled the remarkable acoustic engineering behind these mysterious artifacts. Through detailed analysis of their internal architecture, researchers have decoded how these instruments produce their distinctive, haunting screech. The research team used cutting-edge technology, creating 3D models and analyzing sound recordings from both original death whistles and precise replicas. Their findings reveal that these instruments transcend mere musical function, serving as sophisticated tools of psychological impact. The whistles' unique "hybrid" design combines primal fear responses with complex sound symbolism, creating an acoustic bridge between modern listeners and ancient Aztec ceremonial practices. This discovery provides unprecedented insights into how the Aztecs wielded sound as a powerful tool in their cultural and religious rituals.
/web/2024/12-241122-81

New Insights into the Structure of Sleep

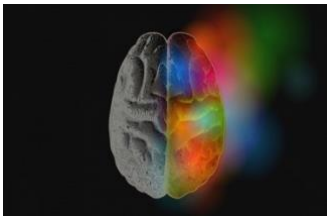
(University of Lausanne, November 28, 2024)



Researchers from the University of Lausanne and the Lausanne university hospital, led by Dr. Georgios Foustoukos, have achieved a remarkable scientific breakthrough in sleep research. Their study explored the role of the locus coeruleus, a specific brain region, revealing its vital function in structuring sleep cycles. Utilizing advanced neuroimaging technologies, the team investigated the neural pathways in mice, uncovering how the fluctuating activity of the locus coeruleus during sleep orchestrates the sleep cycle. This discovery revealed previously hidden structural units of sleep and their coordination, offering new insights into the evolution of sleep across species, including reptiles, by identifying precursor activities in ancient sleep patterns. The implications for understanding sleep disorders are could potentially lead to new strategies to enhance sleep quality.
/web/2024/12-241128-90

Brain Stimulation Effectiveness Tied to Learning Ability, Not Age

(EPFL, November 28, 2024)



A study led by Prof. Dr. Friedhelm Hummel from EPFL, in collaboration with Dr. Pablo Maceira Elvira and teams from the University of Geneva, University of Applied Sciences Western Switzerland (HES-SO), and the NIH National Institute of Neurological Disorders and Stroke, uncovers that the effectiveness of brain stimulation is more closely linked to an individual's learning capability rather than their age. The researchers conducted the study by examining how native learning abilities affect the impact of brain stimulation during a motor task learning process. They discovered that individuals with less efficient learning mechanisms gain more from stimulation, while those with optimal learning strategies may experience adverse effects. This pivotal finding indicates the potential for developing tailored brain stimulation protocols that maximize individual benefits, enabling enhanced interventions in neurorehabilitation, where relearning lost skills is vital.
/web/2024/12-241128-3a

13. Calls for Grants/Awards

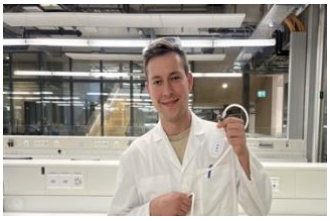
Assistive Technologies for Everyday Use

(ETH Zurich, October 28, 2024)

The third edition of ETH Zurich's CYBATHLON was held on October 26 and 27 at Swiss Arena Kloten, where 67 teams from 24 countries showcased innovations in assistive technology. The 2024 edition included new challenges like the Visual Assistance Course and Assistance Robot Race, demonstrating new possibilities for empowering individuals with disabilities. Participants demonstrated cutting-edge solutions, from seeing-eye canes and robotic guide dogs to advanced intelligent canes and kinaesthetic feedback harnesses. This international effort not only fosters technological advancements but also aims to integrate these solutions into daily life for people with disabilities, bringing together diverse teams to collaboratively push the limits of assistive technology, ultimately enhancing the quality of life for many.
/web/2024/13-241028-b7

Sensor Protects Against Life-threatening Complications of Abdominal Surgery

(EMPA, November 05, 2024)



The 2024 Empa Innovation Award has been given to a team of Empa and ETH Zurich researchers for their innovative sensor system named SensAL. Developed under the leadership of Alexander Jessernig, Dr. Alexandre H. C. Anthis and Prof. Dr. Inge K Herrmann, the sensor enables early detection of post-operative complications following abdominal surgery, a crucial advancement in medical technology. SensAL technology is designed to detect leaks at abdominal sutures through a distinct color change, averting the risk of digestive tract contents leaking, which can have severe consequences. The Empa Innovation Award, which has celebrated excellent innovations since 2006, recognizes standout contributions and successful technology transfers to the private sector.
/web/2024/13-241105-0d

Upcoming Science and Technology Related Events

International Conference on Computers, Data Management and Technology Applications
January 1-2, 2025
https://conferencenext.com/event/2659394
IT, Web & Electronic, Research & Development
Bernina Hotel, Geneva

DACH Permafrost Conference
January 8-10, 2025
https://is.gd/A8Sc7X
Environment & Climate Conditions
Davos

Voxxed Days CERN
January 15, 2025
https://is.gd/1FMCjM
IT, Web & Electronic, Research & Development
CERN, Geneva

International Conference on Machine Learning and Soft Computing
January 18-19, 2025
https://acsty2025.org/mlsc/contact
IT, Web & Electronic, AI
Zurich

International Conference on Advanced Computing
January 18-19, 2025
https://acsty2025.org/adcom/index
IT, Web & Electronic, AI
Zurich

Swiss WEB3FEST Winter 2025
January 13-24, 2025
https://is.gd/GKZeEP
Finance, Banking, Investment & Insurance
Zurich

Zurich Life Science Day
February 4, 2025
https://is.gd/xdGl0a
Scientific, Research & Development
University of Zurich, Campus Irchel

Agriculture Conference
February 5-8, 2025
https://www.agriculture-conference.org/en-gb
Agriculture & Forestry, Human Resources, Education & Training
Goetheanum, Dornach

Swiss Cytometry Meeting
February 5-7, 2025
https://swisscytometrymeeting.ch/
Life Sciences, Health Care & Medical
ETH Zurich

Biology25
February 13-14, 2025
https://wp.unil.ch/biology25/
Scientific, Research & Development
University of Lausanne

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