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Science-Switzerland, April – May 2021

News on Swiss science, technology, education and innovation

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Swissnex 2020 Annual Report

(State Secretariat for Education, Research, and Innovation, April 08, 2021)

Swissnex – the global network connecting Switzerland and the world in education, research, and innovation – recently published its 2020 annual report, in which it presents the many highlights, challenges and ideas that shaped an extraordinary year. In particular, Swissnex used its 20-year anniversary in 2020 as an opportunity to reflect on a number of topics for the future, including "Learning Tomorrow", "Meeting Tomorrow", "Working Tomorrow" and "Living Tomorrow". In addition, Swissnex also hosted more than 210 events and activities in partnership with some 190 Swiss organizations, assisted 53 Swiss startups in their internationalization process and facilitated exchanges between actors on a variety of topics relevant to Switzerland's ERI landscape.
/web/2021/00-210408-69

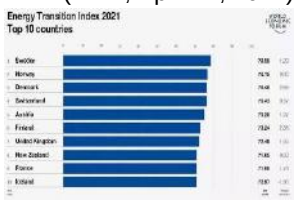
Europe's Largest Capacity Research Centrifuge

(ETH Zurich, April 19, 2021)

The largest capacity geotechnical research centrifuge in Europe was recently installed at the Hönggerberg campus of ETH Zurich, which will enable researchers to simulate geotechnical structures, such as foundations, dams and tunnels, as well as the effects of natural hazards, such as earthquakes, landslides, flooding and tsunamis. The 20-ton centrifuge is also the first one in the world to be vibration insolated, which was achieved by lowering it into a pioneering concrete chamber with extreme precision. The chamber is supported by special steel springs that will absorb vibrations from the centrifuge and prevent them from spreading underground through the campus. Finally, the centrifuge has a capacity of 500 gtons, which means that it can carry up to 2 tons of specimen in an increased gravitational field of 250 g.
/web/2021/00-210419-4d

Switzerland Among Global Energy Transition Leaders

(WEF, April 21, 2021)



Switzerland recently ranked fourth in the World Economic Forum's latest Energy Transition Index, thereby highlighting the Alpine country's substantial commitment to playing a leading role in transforming the energy system for the decades ahead. According to the report, which marks the 10th anniversary of the WEF's benchmarking of countries on their energy transition progress, more than 70% of tracked countries have made progress on energy access and security, primarily due to the improvement in the levels of electricity access around the world, as well as in environmental sustainability, with countries accounting for 88% of global total energy supply improving their scores on this dimension. However, the report also noted that only 13 of the 115 countries have made consistent gains and underlined that more needs to be done to improve the robustness of supplies to newly electrified areas.
/web/2021/00-210421-5f

1. Policy

National Genomic Monitoring Program

(Federal Office of Public Health, May 28, 2021)

The Federal Office of Public Health (FOPH) recently endorsed the establishment of a national genomic monitoring program for SARS-CoV-2, which aims to rapidly identify virus variants of concern, their possible significance for travelers and their distribution within the country. To achieve this, ten laboratories, which include the five university hospitals and a network of privately run laboratories, are taking part in the

program, during which they will help to analyze some 2,000 positive SARS-CoV-2 samples every week. The sequences will subsequently be evaluated by the FOPH, before being officially published on www.covid.19.admin.ch. In addition, the program will also monitor wastewater and perform immunological characterizations of variants of concern to establish whether they are able to circumvent the immunity conferred by vaccines or prior infection.
/web/2021/01-210528-7e

2. Education

Exploiting Potential of Blended Learning

(University of Zurich, April 15, 2021)

Despite the fact that the coronavirus pandemic posed a massive challenge for universities, it also offered a historic opportunity to experiment with the possibilities of digital teaching. This is important, because hybrid teaching and learning formats are not only more effective than pure online instruction, as they can allow students to take a more individualized approach to learning, but, as explained by UZH President Michael Schaepman, they can also help increase the flexibility, mobility and accessibility of higher education. The pandemic furthermore provided an important boost to sustainability, as the significant decrease in air travel by UZH employees helped save almost 6,000 tons of CO2 emissions in 2020, compared to 2019. The aim is therefore now to maintain this level of reduction to achieve UZH's ambitious climate goal of being carbon neutral by 2030.
/web/2021/02-210415-15

Günther Dissertori Appointed Rector of ETH Zurich

(ETH Zurich, May 21, 2021)

The ETH Board recently appointed Professor Günther Dissertori as the new Rector at ETH Zurich, who will succeed Professor Sarah Springman on 31 January 2022. As a professor for particle physics, Dissertori's research work in particular focusses on the CMS experiment at the Large Hadron Collider at CERN, and, among other achievements, his group made an important contribution to experimentally proving the existence of the Higgs boson – the discovery of which earned François Englert and Peter Higgs the 2013 Nobel Prize for Physics. Dissertori is also incredibly passionate about teaching, which has been reflected by him winning four "Golden Owl" awards, as well as the Credit Suisse Award for Best Teaching at ETH Zurich.
/web/2021/02-210521-0e

3. Life Science

Injectable Hydrogel Repairs Tears in Human Tissue

(EPFL, April 14, 2021)

A team of EPFL scientists from the group of Professor Dominique Pioletti recently developed an injectable gel that can attach to various kinds of soft internal tissues and repair tears resulting from an accident or trauma. The hydrogel is made up of 85% water and has two key advantages: it can be injected anywhere in the human body, and it demonstrates high intrinsic adhesion with no extra surface treatment. As explained by postdoctoral researcher Peyman Karami, this novel hydrogel is unique because it "changes

consistency while providing high adhesion to soft tissues." Specifically, it is "injected in a liquid form, but then sets when a light source is applied, enabling it to adhere to surrounding tissue."
/web/2021/03-210414-fb

Novel Antibiotic Circumvents Pathogens' Protective Measures

(University of Basel, April 15, 2021)

A team of University of Basel researchers led by Sebastian Hiller and Timm Maier recently revealed how a newly discovered compound called Darobactin is able to kill many antibiotic-resistant pathogens by circumventing their protective measures. Specifically, the team found that its shape mimics a special 3D structure that acts as a "key" for inserting proteins into the outer shell of bacteria at specific locations, thereby enabling Darobactin to block the keyhole from the outside – like locking a door and then breaking off the key. As a result, the transport route for the bacteria's shell components is obstructed and they die. This discovery is a major achievement, as it gives a boost to the long-cherished hope of finding a new generation of antibiotics to fight many of today's problem pathogens.
/web/2021/03-210415-9d

New Center for Translational Research and Precision Medicine

(ETH Zurich, April 21, 2021)

The University of Zurich and ETH Zurich, together with Zurich's four university hospitals, recently launched a new translational research center called "LOOP Zurich", which aims to improve our basic understanding of diseases to develop therapies that are tailored to the individual. In this context, the hospitals' unparalleled access to patients and the combined research infrastructures at UZH and ETH provide the center with a unique starting point. As highlighted by Detlef Günther, Vice President for Research at ETH Zurich and Chair of the Executive Board of the University Medicine Zurich initiative, they have the "basic research, innovative diagnostics and specialist knowledge in handling medical data to frame and answer excellent scientific questions together," as well as to quickly transfer the benefits of innovation to the patients in the clinics.
/web/2021/03-210421-0f

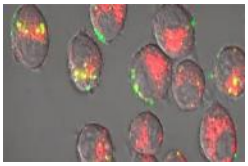
Nanoparticles to Eliminate Resistant Bacteria

(Empa, April 22, 2021)

A team of researchers at ETH Zurich and Empa, led by Professor Inge Herrmann and Tino Matter, recently developed novel nanoparticles that can detect and kill multi-resistant bacteria hiding in body cells. To achieve this, the team combined cerium oxide – a material with antibacterial and anti-inflammatory properties in its nanoparticle form – with a bioactive ceramic material known as bioglass, which has versatile regenerative properties. Although the particles' exact mode of action is not yet fully understood, they have already been successfully used as wound adhesives, whereby several interesting properties can be utilized simultaneously, including being able to stop bleeding, dampen inflammation and accelerate wound healing. In addition, the novel particles show a significant effectiveness against bacteria, while the treatment is well tolerated by human cells.
/web/2021/03-210422-35

Increasing Effectiveness and Precision of Immunotherapies

(University of Geneva, April 22, 2021)

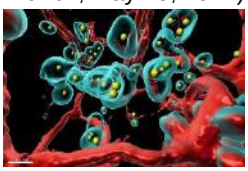


To increase the precision and limit the undesirable side effects of immunotherapies, researchers led by University of Geneva Professor Carole Bourquin, together with the Ludwig-Maximilian University, recently developed silica nanoparticles – which are like little sponges with cavities that can easily filled – with a very precise opening mechanism that enables them to transport a drug exactly to where it should act.

Specifically, the researchers added a lid that reacts according to the pH of its environment, which, as explained by first author Julia Wagner, means that it remains firmly in place while circulating in the pH-neutral blood, but then comes off when the particles arrive in the acidic vesicles inside the cell. As a result, the drug can take effect up to six times longer, thereby making it possible to administer lower and better tolerated doses.
/web/2021/03-210422-a4

Tricking Tumors Into Eliminating Themselves

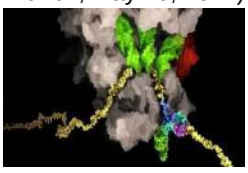
(University of Zurich, May 18, 2021)



A team of researchers led by University of Zurich Professor Andreas Plückthun's postdoctoral fellow Sheena Smith recently modified a common respiratory virus, called adenovirus, to act like a Trojan horse to deliver genes for cancer therapeutics directly into tumor cells. Unlike chemotherapy or radiotherapy, this approach does not harm normal healthy cells, and once inside the tumor cells, the delivered genes serve as a blueprint for therapeutic antibodies, cytokines and other signaling substances, thereby tricking the tumor into eliminating itself through the production of anti-cancer agents by its own cells. Significantly, this so called "SHREAD system" is not only applicable for the fight against breast cancer, but as healthy tissues no longer come into contact with significant levels of the therapeutic agent, it is also applicable for the delivery of a wide range of biologics.
/web/2021/03-210518-31

Exposing Achilles Heel of Coronavirus

(ETH Zurich, May 20, 2021)



A team of researchers from ETH Zurich and the Universities of Bern, Lausanne and Cork recently obtained molecular insights into a special mechanism that enables SARS-CoV-2 to produce its proteins, as well as demonstrated that it can be inhibited by chemical compounds, thereby significantly reducing viral replication in infected cells. To achieve this, the researchers used a series of sophisticated biochemical experiments to capture the ribosome at the so-called "frameshifting site" of the SARS-CoV-2 RNA genome. The results subsequently provided the team with a molecular description of the process at unprecedented detail and revealed a number of novel unanticipated features. In addition, the dependence of SARS-CoV-2 on this ribosomal frameshifting event could be used to develop antiviral drugs.
/web/2021/03-210520-1a

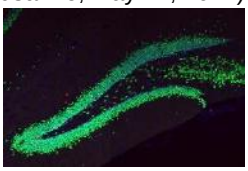
Boosting Effectiveness of Cancer-Fighting Cells

(EPFL, May 26, 2021)

EPFL Professor Li Tan, together with an international team of researchers, recently discovered that an engineered interleukin-10-Fc fusion protein can revitalize exhausted T lymphocytes – our body's immune cells for fighting cancer – by reprograming their metabolism, thereby enhancing their expansion and destructive capacity against cancer. As explained by Tang, interleukin-10-Fc appears to be highly effective and works in synergy with adoptive T cell transfer immunotherapy, such as CAR-T therapy, or immune checkpoint inhibitors. Tang further stated that their method seemed to improve the existing immunotherapies against solid tumors, which are known to be difficult to be cured, and did not produce any obvious side effects during the tests so far.
/web/2021/03-210526-4f

Investigating Antidepressant Effect of Exercise

(University of Lausanne, May 27, 2021)

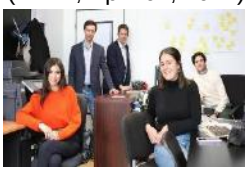


Neuroscientists at NCCR Synapsy recently identified one of the mechanisms behind the antidepressant effect of lactate – a molecule produced by the body during exercise – which not only provides a better understanding of the physiological mechanisms that underpin physical activity, but which should also lead to an improvement in the way depression is treated in the future. As explained by lead investigator Anthony Carrard, the team found that during the conversion of lactate to pyruvate – the output of the metabolism of glucose – cells produce a molecule with antioxidant potential, known as NADH, which protects neurogenesis during a depressive episode. This is crucial, because as the researchers demonstrated during their previous investigations, without neurogenesis, lactate loses its antidepressant power.
/web/2021/03-210527-8f

4. Nano / Micro Technology / Material Science

Self-Healing Composites

(EPFL, April 02, 2021)



EPFL spin-off CompPair recently developed a family of self-healing composites that can repair themselves in just a few minutes when heat (100°C to 150°C) is applied locally, which could considerably lengthen a product's lifespan. As explained by co-founder and CTO Robin Trigueira, the secret lies in their unique resin, part of which, when exposed to heat, becomes activated and undergoes a phase change that triggers the physical mechanisms involved in the healing process. Crucially, the composites do not lose any of their structural properties during the repair process, which means there is no risk of deformation, thereby making them well suited to a broad range of applications. Following the reception of funding from Tech4Impact, as well as being recognized by the Solar Impulse Foundation, the firm recently completed its first fundraising round, raising just under CHF 1M.
/web/2021/04-210402-3a

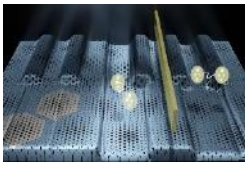
Uniquely Deep X-Ray View Into Matter

(Paul Scherrer Institute, April 22, 2021)

A team of Paul Scherrer Institute researchers led by Cristian Svetina, together with several international partners, was recently able to look inside materials using the method of transient grating spectroscopy with ultrafast X-rays at SwissFEL for the first time. This is not only a milestone for observing processes in the world of atoms, but also contributes greatly to the advancement of technical miniaturization. Specifically, this new and surprising combination enabled the researchers to look inside materials with a resolution down to individual atoms, as well as with ultrashort exposure times of fractions of femtoseconds, for the first time, which even allows videos of atomic processes to be recorded. In addition, the method is element-selective, meaning that one can selectively measure specific chemical elements in a mixture of substances.
/web/2021/04-210422-12

Graphene Flake Becomes Locally Superconducting or Insulating

(ETH Zurich, May 05, 2021)

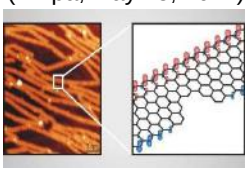


A team of researchers led by ETH Zurich Professors Klaus Ensslin and Thomas Ihn recently succeeded in turning specially prepared graphene flakes into insulators or superconductors by simply applying an electric voltage. This technique even works locally, meaning that regions with completely different physical properties can be realized side by side in the same graphene flake. To achieve this, the researchers put two carbon layers on top of each other in such a way that they make a "magic angle" of exactly 1.06

degrees, thereby creating a moiré pattern. By using different voltages applied to three electrodes, the ETH researchers subsequently produced a so-called Josephson junction, in which two superconductors are separated by a wafer-thin insulating layer, inside the twisted graphene flakes, which could have potential applications in quantum technologies.
/web/2021/04-210505-0b

"Bite" Defects in Graphene Nanoribbons

(Empa, May 25, 2021)



A team of scientists led by EPFL Professor Oleg Yazyev and Empa researcher Roman Faser recently identified a new type of defect as the most common source of disorder in on-surface synthesized graphene nanoribbons (GNR) – a novel class of carbon-based materials that may prove extremely useful in next-generation electronic devices. Specifically, the researchers focused on characterizing the so-called "bite-defects" in armchair-edged and zigzag-edged graphene nanoribbons, as well as investigated their implications on GNR properties. As explained by Gabriela Borin Barin, they were able to observe that even though the presence of these defects can disrupt GNRs' electronic transport, they could also yield spin-polarized currents, which are important findings in the context of the potential applications of GNRs in nanoelectronics and quantum technology.
/web/2021/04-210525-83

Novel Superlattices With Unique Properties

(Empa, May 27, 2021)

By playing with shape-engineered nanoscale building blocks that are up to 100-times larger than atoms and ions, an international team led by Empa and ETH Zurich was recently able to create novel perovskite-style superlattices, which are not only peculiar as far as their structure is concerned, but also with respect to some of their properties. For example, these highly ordered structures are created solely by the force of entropy, which, paradoxically, causes the nanocrystals to always arrange in the densest possible packing, as long as they are designed such that they do not attract or repel each other by other means, such as electrostatics. Furthermore, these new mega-crystals exhibit superfluorescence, thereby making them potential candidates for use as highly energy-efficient, ultrafast light emitters.
/web/2021/04-210527-40

5. Information & Communications Technology

ETH Zurich – PSI Quantum Computing Hub

(ETH Zurich, May 03, 2021)

ETH Zurich and the Paul Scherrer Institute recently established a new joint center under the leadership of Professors Andreas Wallraff and Jonathan Home in order to advance the realization of quantum computers based on both ion traps and superconducting components. As explained by Wallraff, this new center is unique because it will enable the researchers to explore these two technologies in the same laboratory, which, although fundamentally different from a hardware standpoint, could create potential synergies, for example in the development of operating systems. ETH Zurich and PSI also intend to leverage synergies, as researchers at PSI have been working on industry-related quantum technology for some time, and quantum computers developed in the hub will be made available to ETH Zurich researchers from various departments.
/web/2021/05-210503-e6

Innovative Credit Card Fraud Detection System

(Università della Svizzera italiana, May 03, 2021)

A team of researchers at the Università della Svizzera italiana led by Dr. Bruno Buonaguidi and Professor Antonietta Mira, in collaboration with a major credit card company in Switzerland, recently developed an innovative probabilistic model for the efficient detection of fraudulent transactions. As explained by Buonaguidi, the algorithm first studies the behavior of credit card users to understand their purchasing habits, as well as the characteristics of transactions that are known to be fraudulent, in order to return, for each credit card user, a personalized threshold that will be used to declare the nature of the transactions. In the second step, the algorithm then calculates the probability that a subsequent transaction of a credit card user is fraudulent, and when this probability exceeds the threshold referred to in the previous point, the fraud alarm is raised.
/web/2021/05-210503-e3

Liquid Lens in Flagship Smartphone

(startupticker.ch, May 06, 2021)

A Chinese tech giant recently released a new flagship phone, which features a novel liquid lens element that was developed by Swiss optics company Nextlens – a sister company of the ETH Zürich spin-off Optotune. Although the name of the customer and the model was not mentioned in Nextlens' press release, there is clear evidence that the technology is used in Xiaomi Technology's Mi Mix Fold. This miniaturized Swiss lens is particularly special because it works like the lens in the human eye, meaning it can change its shape to focus on an object. Traditional cameras, by contrast, move rigid lenses back and forth. This degree of freedom therefore propels novel camera designs and brings features to mobile phones, which were previously only available in professional DSLR cameras.
/web/2021/05-210506-60

Light-Based Approach for Reading Out Superconducting Circuits

(EPFL, May 12, 2021)

A team of researchers led by EPFL Professor Tobias Jan Kippenberg recently developed a light-based approach to read out superconducting circuits, thereby overcoming the scaling-up limitations of quantum computing systems. To achieve this, the scientists replaced the low-noise high-electron mobility transistor (HEMT) amplifiers and coaxial cables with a lithium niobate electro-optical phase modulator and optical fibers, respectively, which not only enables the engineering of large-scale quantum systems without requiring enormous cryogenic cooling power, but also facilitates long-range transfer and networking between quantum systems. The team is currently developing advanced electro-optical devices based on integrated lithium niobate technology to significantly enhance their method's conversion efficiency and lower noise.
/web/2021/05-210512-cf

AI Solutions for Precise Touch Screens

(ETH Zurich, May 12, 2021)

ETH Zurich computer science Professor Christian Holz, together with his doctoral student Paul Streli, recently developed a new AI solution called "CapContact", which enables touchscreens to reliably detect when and where fingers actually touch the display surface, with much higher accuracy than current devices do. To achieve this, CapContact not only uses the touch screens as image sensors to estimate the actual contact areas between fingers and touchscreens upon touch, but also generates these contact areas at eight times the resolution of current touch sensors, thereby enabling their devices to detect touch much more precisely. The team also demonstrated that CapContact can remove errors due to the low-resolution

input sensing, as well as reliably distinguish the touch surfaces even when fingers touch the screen very close together.
/web/2021/05-210512-3f

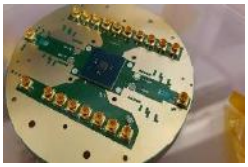
Borderless Data Analysis Video Competition

(University of Applied Sciences and Arts Northwestern Switzerland, May 14, 2021)

The FHNW School of Business, together with Newcastle University and Nihon University, recently launched the "Borderless Data Analysis Video Competition" – an innovative project series to promote international academic collaboration in the digital age. For the FHNW School of Business, the first edition of this competition was a great success, not only from the perspective of a co-organizer, but also of the participants, as two FHNW students were among the three winning teams. Specifically, Linda Messerli ranked second with her team for their analysis of safety statistics for female travelers in the London public transport system, while Jessica Bieselt and her group placed third with their evaluation of unemployment statistics after the first wave of the COVID-19 pandemic in 2020.
/web/2021/05-210514-2d

Cryogenic Chip to Control Quibits

(EPFL, May 17, 2021)



A team of engineers from EPFL, QuTech and the Intel Corporation recently designed and tested a novel cryogenic chip that can control qubits, thereby opening the door to solving the so-called “wiring bottleneck”. To achieve this, the engineers exploited the same technology adopted for the conventional microprocessor – namely, the CMOS technology – while, as explained by Professor Edoardo Charbon, using special techniques in the chip design to ensure the right operation, as well as to drive qubits with high accuracy. As a result, the controller chip and qubits can be integrated on the same die – because they are all fabricated in silicon – or package, thus further relieving the wiring bottleneck. Subsequent tests demonstrated that the gate fidelity of this new system is very high (99.7%) and limited not by the controller, but by the qubits themselves.
/web/2021/05-210517-19

New Institute for Cybersecurity and Engineering

(Bern University of Applied Sciences, May 25, 2021)

The Bern University of Applied Sciences recently decided to combine its activities in the field of cyber security at the Institute for Cybersecurity and Engineering (ICE), which aims to make a major contribution to the security of society in an increasingly digitalized world. To achieve this, the Institute will in particular focus on two growth areas in its newly formed "Cyber Threat Intelligence" and "FinTech Security" research groups. Specifically, the Cyber Threat Intelligence research group will focus on the field of data- and analysis-based cyber protection, while developing software products to detect and prevent cyberattacks, together with new tools and solutions for reverse engineering of malware. The FinTech Security research group on the other hand will develop secure and open payment systems, as well as conduct research into virtual and cryptocurrencies.
/web/2021/05-210525-61

Confidential Smart Contracts for Industry 4.0

(University of Neuchâtel, May 27, 2021)

A team of researchers led by University of Neuchâtel Professor Pascal Felber and PhD student Christian Göttel recently developed a prototype called TZ4Fabric, which demonstrated that confidential smart contracts are not only practical, but, most importantly, also resilient to a wide range of cyberattacks. To achieve this, TZ4Fabric isolates the execution of smart contracts to the so-called “TEE” – an isolated area on a processor that is dedicated to confidentially executing programs and rendering them inaccessible

from outside the security perimeter – specifically for the open source Hyperledger Fabric blockchain framework, which, thanks its consistency guarantee, reduces computational complexity and energy requirements. As a result, companies are provided with new opportunities and additional security guarantees over current smart contract technologies.
/web/2021/05-210527-c5

6. Energy / Environment

Bioenergy with Carbon Capture and Storage

(ETH Zurich, April 05, 2021)

A team of researchers led by ETH Zurich Professor Marco Mazzotti recently calculated the climate action potential of carbon capture during the processing of biomass feedstock – also known as "bioenergy with carbon capture and storage" (BECCS) – and found that if BECCS were exploited to its full potential, it would reduce carbon emissions in Europe by 200 million tons per year, which represents 5% of European emissions in 2018. In Switzerland, the BECCS potential is about 6%, which could largely be made up by waste incineration plants. However, the authors also highlight that fully exploiting the calculated potential of BECCS will be challenging in practice, because although the technology for capturing CO2 at the point sources is already ready to go, there currently is not yet a network to transport the captured carbon to storage locations.
/web/2021/06-210405-86

New NEST Unit for Circular Construction

(Empa, April 13, 2021)

At NEST, the research and innovation platform of Empa and Eawag, the new "Sprint" unit is currently under construction – a COVID-compliant office unit built largely from recycled materials, which aims to set new standards for circular construction. To achieve this, special attention was already paid to the re-use process and its challenges in the planning phase, and right from the start, the design took dismantling into account. Furthermore, the construction method facilitates future modifications and disassembly for the recovery of systems, components and materials, thus ensuring that, at the end of their regular life span, buildings can be transferred to another use cycle as efficiently as possible. This is not only more sustainable than conventional methods, but as stressed by Kerstin Müller, it also provides opportunities for the value and supply chains.
/web/2021/06-210413-f1

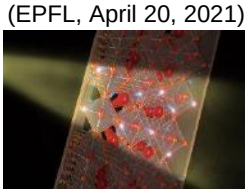
Solar Impulse Identifies 1,000+ Sustainable Solutions

(startupticker.ch, April 16, 2021)

Bertrand Piccard and the Solar Impulse Foundation recently surpassed their target of identifying and awarding 1,000 clean and profitable solutions with the Solar Impulse Label. To date, more than 1,100 solutions worldwide have received this label, including the following Swiss startups, which joined the portfolio this year: Miraex (photonics sensing solution), Ponera Group (IoT enabled modular pallets), bNovate Technologies SA (early warning system for abnormal microbial conditions), Clean Air Enterprise AG (smart e-filter), Mosan Sanitation Solution (circular sanitation solution), CLEMAP (energy analytics, portals & electricity metering solutions), CORTEXIA (clean & sustainable cities), ECCO2 Solutions AG (predictive heating control), NeoCarbons (CO2 recycling technology), ennos ag (solar pump) and BIBOU'TIC (maternity & baby clothing rental).
/web/2021/06-210416-b4

Highly Efficient and Stable PV Cells

(EPFL, April 20, 2021)



A team of scientist led by EPFL Professor Michael Graetzel recently employed a new chemical trick to push the power-conversion efficiency and operational stability of perovskite solar cells to 25.6% and at least 450 hours respectively. To achieve this, the researchers used a so-called "anion engineering concept" to augment the crystallinity of FAPbI3 films – which have emerged as the most promising semiconductor for highly efficient and stable perovskite solar cells – as well as to suppress structural defects that are usually present at grain boundaries and at the surface of perovskite films. This is significant, as it not only provides a direct route to eliminate the most abundant and deleterious lattice defects present in metal halide perovskites, but also facilitates access to solution-processable films with improved optoelectronic performance.
/web/2021/06-210420-28

Uncertainty of Southern Ocean CO2 Uptake Cut in Half

(University of Bern, April 28, 2021)

A team of University of Bern climate scientist composed of Jens Terhaar, as well as Professors Thomas Froelicher and Fortunat Joos recently developed a new method that reduces the significant uncertainty of how much CO2 the Southern Ocean – the world's largest ocean sink region for anthropogenic CO2 – can absorb by 50%, thereby enabling researchers to make more accurate climate projections. Encouragingly, the new calculations also illustrated that by the end of the 21st century, the Southern Ocean will absorb around 15% more CO2 than previously thought. However, this is only a tiny bit of help on the extremely challenging path to achieving the goals of the Paris climate agreement. As underlined by Joos, "the reduction of human-made CO2 emissions resulting from the combustion of fossil fuels remains extremely urgent."
/web/2021/06-210428-3b

Resilient and Sustainable Energy Supply

(Paul Scherrer Institute, May 04, 2021)

A consortium led by the Paul Scherrer Institute recently launched the "SUstainable and Resilient Energy for Switzerland" (SURE) project, which will investigate how Switzerland can ensure that its energy supply is as sustainable, adaptable and resilient as possible in the coming decades. Against this backdrop, the SURE project will feature a close collaboration with 16 practitioners, including local authorities, energy providers and policymakers, and as well as three case studies in Ticino, Zurich and the Basel region, which will focus on specific aspects. Future plans include an online platform to help a broad section of the public to better understand the tradeoffs between the various dimensions of sustainability and resilience, and to resolve the potential conflicts between competing measures for achieving a sustainable and stable energy supply.
/web/2021/06-210504-4f

Role of Finance in Climate Mitigation Scenarios

(University of Zurich, May 26, 2021)

University of Zurich Professor Stefano Battiston, together with an international research group, recently demonstrated how climate mitigation scenarios can be improved by taking into account that the financial system can play both an enabling or a hampering role on the path to a sustainable economic system. Specifically, the researchers combined large-scale Integrated Assessment Models, on which current climate mitigation scenarios are based, with a climate-financial risk assessment in a circular way, which enabled them to show how the perception of the financial system and the timing of the introduction of climate policy measures interact in the low-carbon transition. This feedback loop can subsequently be

used to map possible changes in investors' expectations, thereby leading to more coherent scenarios to assess climate-related financial risk.
/web/2021/06-210526-9d

7. Engineering / Robotics / Space

Mobile Hand-Washing Station Recycles Own Water

(Eawag, April 12, 2021)

A team of Eawag researchers recently developed a mobile hand-washing station that hygienically recycles its own water without water mains or sewage connection. This has great potential for deployment in countries lacking in infrastructure, as well as in public transport or at events. This module was initially developed as part of the "Blue Diversion Autarky Toilet" project, which aimed to create a standalone toilet that could function without the need for a water mains or sewage connection. However, in designing their system, the researchers wanted to ensure that the three modules for treating the water, urine and feces could also function and have the ability to be deployed independently of each other. In this context, the Autarky water module has since proven itself as a standalone unit that can recycle even large volumes of water for hand-washing.
/web/2021/07-210412-d2

Predictive Control Model for Drone Swarms

(EPFL, May 18, 2021)

A team of EPFL engineers led by PhD student Enrica Soria recently developed a predictive control model that allows swarms of drones to fly in cluttered environments quickly and safely. Specifically, the model works by programing in locally controlled, simple rules, such as a minimum inter-agent distance to maintain, a set velocity to keep, or a specific direction to follow, thereby enabling the drones to not only react to others in a swarm, but also to anticipate their own movements and predict those of their neighbors. As a result, the drones are much less dependent on commands issued by a central computer, and subsequent test runs confirmed that this novel system improves the speed, order and safety of drone swarms in areas with a lot of obstacles.
/web/2021/07-210518-45

Governance of Risks Related to Space Debris

(EPFL, May 19, 2021)

The EPFL International Risk Governance Center, in collaboration with the EPFL Space Center (eSpace) and Space Innovation, recently launched a new program to study the governance of risks related to space debris, as well as to assess policy options to ensure the safe and sustainable use of space. This is vital, because although space technology advances every day, the binding international agreements behind space activity have not evolved since the 1960s and 1970s, and compliance with subsequent non-binding guidelines remains low. As stated by IRGC executive director Marie Valentine Florin, the new program therefore aims to "support policymakers and other decision-makers by developing realistic approaches to deal with this problem, and to bridge the knowledge and communication gaps between space debris experts and the wider community."
/web/2021/07-210519-fa

Universe May Be Hotter Than Expected

(University of Geneva, May 25, 2021)

Benjamin Bose and Professor Lucas Lombriser from the University of Geneva recently proposed a new cosmological theory that aims to reconcile several key inconsistencies between cosmological theory and observations. Specifically, the researchers chose to analyze the observational data that produces these inconsistencies by not assuming a particular temperature of the cosmic microwave background (CMB) or the curvature of the Universe. This not only decreased the inconsistencies in the temperature variations of the CMB and its trajectory, but also removed those linked to the speed of the expansion of the Universe and the spatial differences in the density of matter. In this context, the researchers hypothesize that the Earth is located in an under-dense region within the Universe, thereby implying that the Universe is hotter than previously thought.
/web/2021/07-210525-3d

Investigating How Matter Is Distributed in Space

(ETH Zurich, May 31, 2021)

A team of ETH Zurich researchers led Professor Alexandre Refregier, together with his postdoc Devin Crichton, engineer Thierry Viant, as well as several University of Geneva scientists, is developing an innovative system for HIRAX – a new telescope array comprising hundreds of small radio telescopes, which will make it possible to measure the distribution of hydrogen in the universe on a large scale. This is significant, because as explained by Refregier, “if we can use hydrogen, the most common element in the universe, to discover how matter is distributed in space, we could then draw conclusions about what dark matter and dark energy are made of.” In this context, the Swiss researchers are developing a so-called “digital correlator”, which will combine the signals recorded by each of the approximately six-meter telescopes.
/web/2021/07-210531-5a

8. Physics / Chemistry / Math

Easily-Tunable Fluorescent Polymers

(ETH Zurich, April 07, 2021)

A team of researchers led by ETH Zurich group leader Yinyin Bao recently developed a new approach that enables them to generate a broad palette of colors using fluorescent organic polymers. Specifically, the team demonstrated that the fluorescence of the polymers not only depends on the structure of the chain links and ends, but also on the number of chain links. This subsequently enabled the researchers to precisely tune their color by regulating the number of chain links using a method called "living polymerization". Currently, the researchers can produce fluorescent polymers in yellow, green and blue, but they are working on extending the principle to include other colors, including red. These new polymers have a wide range of potential applications, including laboratory diagnostic procedures, solar energy, and security printing.
/web/2021/08-210407-5a

Critical Physics in Quantum Magnets

(Paul Scherrer Institute, April 14, 2021)

An international team of researchers led by EPFL Professors Henrik Rønnow and Frédéric Mila, in collaboration with the Paul Scherrer Institute, recently studied a discontinuous phase transition to observe the first ever critical point in a quantum magnet, similar to that of water. To achieve this, the researchers applied both pressure and a magnetic field to milligram pieces of SCBO – a quantum antiferromagnetic material that is especially useful for understanding how the quantum aspects of a material's structure affect its overall properties. As explained by Rønnow, this allowed them to look all around the discontinuous quantum phase transition and to find critical-point physics in a pure spin system. These findings are important because the next generation of functional quantum materials will be switched across discontinuous phase transitions.
/web/2021/08-210414-4e

Quantum Steering for More Precise Measurements

(University of Basel, April 23, 2021)

Matteo Fadel from the University of Basel, together with international colleagues, recently demonstrated how particular types of quantum states known as "quantum steering" can be used to perform measurements with higher precision than quantum physics would ordinarily allow. Quantum steering describes the fact that in certain quantum states of systems consisting of two particles, a measurement on the first particle allows one to make more precise predictions about possible measurement results on the second particle than if only the measurement on the second particle had been made. In this context, the researchers were able to measure quantum steering for the first time between two clouds, thereby creating a solid mathematical basis to systematically study and demonstrate the usefulness of quantum steering for metrological applications.
/web/2021/08-210423-b2

Misinformation in the Age of the Internet

(University of Fribourg, May 19, 2021)

By applying the methods of complex systems physics to the problem of misinformation in the age of the Internet, a team of University of Fribourg researchers led by Dr. Matúš Medo recently demonstrated that in such systems, where the subjects are extremely numerous, the same point of departure can lead to diametrically opposed conclusions. As a result, honest citizens trying to form an opinion can not only arrive at an erroneous conclusion, but can also become a source of misinformation themselves. As explained by Medo, their results suggest that the more complex the world becomes, the more likely it is that our simple methods of forming opinions can lead us astray and cause us to form erroneous opinions. However, the models also indicate that this can be countered by investing effort in increasing the number of reliable opinions.
/web/2021/08-210519-9a

9. Architecture / Design

First Method to Assess Quality of Baukultur

(Federal Office of Culture, May 17, 2021)

The Federal Office of Culture, together with international partners, recently published the "Davos Baukultur Quality System" – the first method for the objective and comprehensive assessment of the quality of Baukultur, which also offers an aid to the practical achievement of excellence in the field. Specifically, the System, which was developed on the basis of the Davos Declaration and following the "Getting the

measure of Baukultur" conference in Geneva, is based on the fact that high-quality Baukultur is not purely subjective, but can also be assessed objectively. As such, it sets out the following eight quality criteria: governance, functionality, environment, economy, diversity, context, sense of place, and beauty. Moreover, it is important to emphasize that social, emotional and cultural criteria are placed on an equal footing with technical and functional criteria.
/web/2021/09-210517-0f

New Center for Augmented Computational Design

(ETH Zurich, May 27, 2021)

ETH Zurich is launching a new Center for Augmented Computational Design in Architecture, Engineering and Construction, called "Design++", which will bring together 22 professorships from multiple departments to develop digitally augmented design tools, which aim to improve the efficiency and sustainability of construction. As explained by Professor Robert Flatt, their goal is extended creativity, meaning they want to optimize buildings using new design tools, while simultaneously broadening the architectural scope by digital means. As a result, variables, such as a structure's ecological footprint, life cycle, construction and operating costs, as well as the building quality, can be taken into consideration or influenced with greater precision during the design phase, thereby enabling the planners, as well as the building contractors, to rely on data-based decision-making tools.
/web/2021/09-210527-07

10. Economy, Social Sciences & Humanities

Conspiracy Theories and Cognitive Biases During COVID-19

(University of Basel, April 07, 2021)

A team of researchers led by Sarah Kuhn and Thea Zander-Schellenberg of the University of Basel recently investigated the endorsement rates of coronavirus-related conspiracy theories in German-speaking Switzerland and Germany, together with the associated psychological factors, and found that just below 10% of all respondents strongly agreed with a conspiratorial statement. However, contrary to previous research, which assumed that conspiracy theories went hand in hand with characteristics such as poor analytical thinking skills and hasty conclusions, the researchers also found evidence that the opposite might be the case. As stated by Kuhn, these findings therefore underline that we should be careful with generalizations about supporters of conspiracy theories, and illustrate the importance of studying the cognitive mechanisms of conspiracy theories.
/web/2021/10-210407-d8

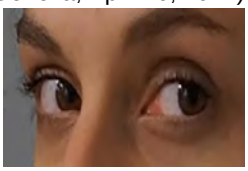
New Measure to Predict Stress Resilience

(University of Zurich, April 15, 2021)

A team of University of Zurich researchers recently demonstrated that increased sensitivity in a specific region of the brain contributes to the development of anxiety and depression in response to real-life stress. To achieve this, the researchers gave a task to a group of emergency room interns that required them to process conflicting emotional information, which activated the locus coeruleus-norepinephrine (LC-NE) system – a region of the brain associated with regulating our response to stress and resolving conflict. As explained by Marcus Grüschow, the results illustrated that "the more responsive the LC-NE system, the more likely a person will develop symptoms of anxiety and depression when they're exposed to stress," thereby establishing an objective neurobiological measure for stress resilience in humans.
/web/2021/10-210415-49

Emotion and Attention Influence Perception of Time

(University of Geneva, April 20, 2021)



A team of researchers led by University of Geneva Professor Nicolas Burra recently investigated how we perceive time, which varies according to the emotional or attentional processing of the visual stimulus, and discovered that when we make eye contact with another person, our attention is directly solicited, thereby causing a distortion in our temporal perception that makes time appear shorter than it really is. However, this underestimation of time does not occur when we look at a non-social object. As explained by Burra, their research is important, because it will make it possible to develop a diagnostic tool to evaluate the mechanisms at work in people who are sensitive to social gaze, and then to act accordingly if disorders in the processing of social stimuli are detected, for instance in the case of autism or schizophrenia
/web/2021/10-210420-f7

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

"Blaze" Accelerator for Fast-Deploying Startups

(startupticker.ch, April 09, 2021)

EPFL recently launched a six-month accelerator program called "Blaze", which aims to forward leading student startups up to a successful market launch by providing them with funding, personalized coaching from business and technology experts, as well as access to an international network of entrepreneurs and investors. As explained by André Catana, head of the EPFL Startup Unit, the goal is to build a unique EPFL Launchpad, which addresses the needs of researchers and students who are motivated by the startup path, by providing support, tools and skills throughout the whole incubation journey at EPFL. Furthermore, the team also wishes to focus on infusing soft skills, sustainability and ethics thinking to all of its startupers.
/web/2021/11-210409-fc

6 Swiss Founders in Forbes 30 Under 30 Europe

(startupticker.ch, April 09, 2021)

The following six Swiss startup founders were recently featured in the latest edition of the Forbes 30 Under 30 Europe list, which identifies and honors personalities from across Europe that have made a tremendous impact on business and society. Freddy Hunziker: “New Roots AG” aims to enable people to enjoy animal-free cheese without comprising on taste and quality. Nicole Aegerter: “Antefil Composite Tech” (an ETH Zurich spin-off) develops microengineered hybrid fibers for large structures. Robin Gnehm, Nicholas Hänny and Carla Vilela Gonzaga Hänny: “NIKIN AG” offers sustainable and fair fashion and promises to plant a tree for every product sold. Wiktor Bourée: “Technis” creates smart flooring, capable of sensing, recognizing and predicting activity happening at its surface. In addition, soon-to-be EPFL Professor Antoine Bosselut was also featured on the list.
/web/2021/11-210409-88

Study on Founders Market Switzerland

(startupticker.ch, April 14, 2021)

IFJ, together with PostFinance and the LINK Institute, recently published the results of their "Founders' Market Switzerland" study, which, for the first time, empirically investigated what lies behind the new entries in the Swiss Commercial Register. In this context, the study came to the conclusion that approximately two thirds of the nearly 47,000 new entries in 2020 were "genuine startups", which effectively took up

a new activity. The study also found that a typical founder sets up a new company in less than 6 months after coming up with the idea – usually alone and with a maximum of CHF 20,000 in startup capital. Finally, a third of those surveyed said they were less well-off due to the Corona pandemic, while 37% said they had survived the crisis unscathed so far and 7% were even able to benefit.
/web/2021/11-210414-71

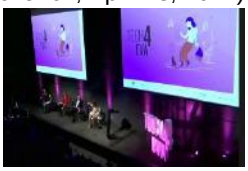
Swiss m4m Center Certified for Medical Devices

(Empa, April 20, 2021)

The Technology Transfer Center for 3D Printing in Medical Technology ("Swiss m4m Center") recently met the demanding ISO 13485:2016 standard for medical devices, which allows it to produce implants and instruments for human patients. The facility contains three massive 3D printers, as well as several other pieces of equipment that are vital for its successful operation. These for example include a refrigerator-sized device to sift and clean the raw material for the printer, a "de-powdering" machine, which rotates and turns finished workpieces under vibration until every last grain of powder has trickled down, and a "furnace" in which printed parts are gradually heated to 600 to 800 degrees in order to eliminate internal stresses. Interest in the Swiss m4m Center is already soaring, which, in addition to technology transfer, will also focus on knowledge transfer.
/web/2021/11-210420-79

Inaugural "Tech4Eva" Accelerator Program

(startupticker.ch, April 23, 2021)



Following the reception of over 110 applications, 30 early and growth stage startups were recently selected to participate in the inaugural edition of Switzerland's first FemTech accelerator program – Tech4Eva – including the following 11 teams from Switzerland. Growth stage: Annaida Technologies, ASPIVIX, MOMM, MUVON Therapeutics AG and Testmate Health. Early stage: CorDiFio Health, Haplomind, KOVE medical Ltd, PhenomX, Soleil and Yoni Solutions. Tech4Eva is a joint endeavor of the EPFL Innovation Park and Groupe Mutuel, which aims to accelerate the growth of promising Femtech startups, as well as to create an innovation platform in Switzerland, where disruptive startups and projects from around the globe can meet and develop innovative solutions for improving or advancing technologies relating to women's health.
/web/2021/11-210423-58

12. General Interest

Experiences of Pursuing an Academic Career

(University of Zurich, April 26, 2021)

A career in academia involves a great deal of uncertainty, and often researchers spend many years not knowing whether they will ever achieve their goal of obtaining a permanent professorship at a higher education institution. In order to understand what drives them on this difficult path, the University of Zurich therefore asked four young researchers – Tommaso Patriarchi, Stefan Dudli, Sarah Ebling and Raphaèle Preisinger – about their experiences, the obstacles they needed to overcome and the ingredients of their previous success. The interviews revealed that all four researchers have a deep passion and enthusiasm for scholarship and for their research field, but also that success is as much about passion and enthusiasm as it is about perseverance, resilience and luck.
/web/2021/12-210426-b0

2021 SNSF Scientific Image Competition Winners

(Swiss National Science Foundation, April 28, 2021)

The Swiss National Science Foundation recently announced the following winners of their 2021 Scientific Image Competition, which not only illustrated the variety of top-flight research being conducted in Switzerland, but also its aesthetic aspects: "Object of study" category – Eloisa Aldomar (Zurich University of the Arts); "Women and men of science" category – Lukas Munz (University of Bern); Locations and instruments" category – Valentin Rime (University of Fribourg); "Video loop" category – Louis Vandenabeele (ETH Zurich); Public vote winners – Nicolas Antille (EPFL) & Daniel Huber (University of Geneva). In addition to the winning prizes, the jury also awarded eleven distinctions in the different categories.
/web/2021/12-210428-ea

SNSF Supports Creative Research Ideas

(Swiss National Science Foundation, May 12, 2021)

As part of its project funding scheme, the Swiss National Science Foundation is supporting 314 new research projects that address a wide variety of topics, such as: the lack of female professors at universities (Patricia Funk, Università della Svizzera italiana); the development of basic motor skills in childhood (Christian Herrmann, Zurich University of Teacher Education); the optimization of treatment for patients with calcified cerebral vessels (Mirjam Heldner, University Hospital Bern); the reaction of wheat to environmental influences (Achim Walter, ETH Zurich); new, automated methods for the chemical synthesis of proteins and protein building blocks (Nina Hartrampf, University of Zurich); and the rate at which the universe is expanding (Frederic Courbin, EPFL).
/web/2021/12-210512-c4

HSG Impact Award 2021

(University of St.Gallen, May 25, 2021)

The following three research projects recently received the HSG Impact Award 2021, which acknowledges research projects at the University of St.Gallen that have an especially clearly recognizable impact on society: Professor Sebastian Utz developed a new sustainable investment portfolio model, which optimizes reciprocal risk, return and sustainability impact; Professors Martin Brown and Matthias Fengler developed a dashboard that provides detailed weekly data on consumption expenditure in Switzerland, thereby contributing towards the public debate on the economic impact of the pandemic; and finally, Professors Charlotta Sirén, Joakim Vincent and Dietmar Grichnik, together with Research Associate Mike Hudecheck, developed a global platform to track the economic and social impacts of SARS CoV 2, as well as of future disasters.
/web/2021/12-210525-75

13. Calls for Grants/Awards

TOP 100 Swiss Startup Award Public Voting

(Venturelab, May 11, 2021)

Venturelab recently opened the public voting for the TOP 100 Swiss Startup Award 2021, which enables anyone with a LinkedIn account to vote for who they believe is the most innovative Swiss startup until July 18, 2021. Contrary to previous years, the TOP 100 Public Vote will not only have one, but 10 winners – one from each of the following verticals: biotech, cleantech, engineering, fintech, foodtech, ICT, medtech, proptech, robotics, and security. To vote, simply visit "https://lnkd.in/dQaJbVJ" and click the golden "Vote now" button on the startup's profile. The TOP 100 Public Vote runs parallel to expert jury ranking and

highlights outstanding Swiss startups, which will be celebrated on stage at the award night on September 8, 2021.
/web/2021/13-210511-5f

Swisscom StartUp Challenge 2021

(startupticker.ch, May 17, 2021)

After 5G innovations in 2020, Swisscom is now looking for the best cyber security solutions from startups and research teams for this year's edition of the "Swisscom StartUp Challenge". Anyone who has developed a prototype, product or solution that is usable in Switzerland, and which recognizes and defends against security risks faster or helps organizations to sensitize employees, can apply immediately. The winner can look forward to an exploration program in Switzerland and – with some luck – even in Silicon Valley. In addition, the five winners will be given the chance for business cooperation and an investment by Swisscom Ventures. Registration deadline: 4 July 2021.
/web/2021/13-210517-55

Boldbrain Startup Challenge 2021

(Università della Svizzera italiana, May 18, 2021)

Fondazione Agire and the USI Startup Centre recently opened the registrations for the 2021 Boldbrain Startup Challenge – a three-month business accelerator program for early-stage startups and innovative ideas. The cash prizes up for grabs total CHF 120k and in-kind prizes CHF 73k, including a full scholarship worth CHF 52k for the winner to attend the USI Executive MBA. In order to make the program even more comprehensive, Boldbrain 2021 comes with a few new features, including the following topics, which will be thoroughly explored during the three-month acceleration: business model and value proposition, legal, financial and intellectual property issues and, last but not least, the key lesson on how best to present your idea in front of a jury, audience or investors. Application deadline: 16 July 2021.
/web/2021/13-210518-57

Watt d'Or 2022

(Swiss Federal Office of Energy, May 27, 2021)

The Swiss Federal Office of Energy is currently seeking submissions for the Watt d'Or 2022 – a prestigious annual prize awarded to the best Swiss energy projects in the following four categories: energy technologies, renewable energy, energy-efficient mobility and buildings & space. Although the Watt d'Or does not take the form of prize money, it will draw considerable attention to each award-winning project, person or organization, meaning that holders will be able to use the award for advertising or PR purposes, thereby enhancing their image and benefitting from extensive media presence. Anyone may nominate projects, individuals or organizations for the award by submitting the relevant form by e-mail until 16 July 2021.
/web/2021/13-210527-70

Upcoming Science and Technology Related Events

Showcase 2030
June 15-16, 2021
https://is.gd/MXocqc
Sustainable Tech, Startups, Research
Online

Startup Days 2021
June 23, 2021
https://is.gd/BV8vDo
Startups, Scaling, Pitching
Kursaal (Bern) & online

Swiss Governance Forum 2021
June 24, 2021
https://is.gd/ZMxYCz
Sustainable Development, State Action
Bern

Swiss Nano Convention
June 24-25, 2021
https://is.gd/qKm98r
Nano, Innovation, Investing
Online

Swiss National Photovoltaics Conference
July 1-2, 2021
https://is.gd/NCcoyl
Energy, Renewables, PV
Bern

Female Innovation Forum
July 2, 2021
https://is.gd/go5lfh
Innovation, Startups, Awards
Dielsdorf (ZH)

The **Science-Switzerland** newsletter is a bimonthly electronic publication keeping you updated on all the latest news on Swiss science, technology, education, innovation and the arts. It is an official publication in English from a single source, with executive summaries of top-highlights on education, of new discoveries in science, and of the latest top-of-the-line technologies and innovational strengths of Switzerland. The Science-Switzerland Newsletter is produced by Swissnex in China in collaboration with the Swissnex network.

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