



# Science-Switzerland, August-September 2018

News on Swiss science, technology, education and innovation



## Table of Contents

1.	Policy .....	2
2.	Education .....	3
3.	Life Sciences / Health Care .....	6
4.	Nano / Micro Technology / Material Science .....	11
5.	Information & Communications Technology .....	14
6.	Energy / Environment .....	15
7.	Engineering / Robotics / Space .....	20
8.	Physics / Chemistry / Maths .....	21
9.	Architecture / Design .....	22
10.	Economy, Social Sciences & Humanities .....	23
11.	Startups / Technology Transfer / IPR / Patents .....	25
12.	General Interest .....	26
13.	Calls for Grants/Awards .....	27
	Upcoming Science and Technology Related Events .....	28

## Federal Councilor Johann Schneider-Ammann Resigns

(NZZ, September 25, 2018)

Johann Schneider-Ammann announced his resignation for the end of the year, eight years after his election. The Federal Councilor says that he wants more time for family. The Confederation of the Swiss economy, Economiesuisse, praised Schneider-Ammann as a defender of the Swiss economy. The industry association Swissmem thanked Schneider-Ammann in a tweet for his "persistent, convinced and inspiring commitment to prosperity and jobs in Switzerland". The Director General of the WTO, Roberto Azevedo, describes Schneider-Ammann as a "bridge builder". Schneider-Ammann has always been anxious to make the multilateral system and the institution "more efficient" and "fairer". SVP/UDC President Albert Rösti says Schneider-Ammann has done everything to secure jobs in Switzerland and has been a reliable partner in economic matters and values that he upheld the civil values during his term. The CVP/PDC/PPD thanks Schneider-Ammann for his commitment to Switzerland as a business location. His commitment has helped Switzerland retain its good economic power and conclude various free trade agreements. SP/PS National Councilor Roger Nordmann pays tribute to Schneider-Ammann's achievements in vocational training and export industry support.

<http://swissinnovation.org/news/web/2018/00-180925-62>



## Federal Councilor Doris Leuthard Resigns

(NZZ, September 27, 2018)

Doris Leuthard announced her resignation from the Federal Council the end of the year. Leuthard left open what she will do after her time in the Federal Council. She certainly wants to spend more time with her family, she said. CVP/PDC/PPD Switzerland praised the Federal Councilor as "one of the strongest personalities of recent years". Thanks to her unique political instinct and her ability to create majorities, Leuthard has always contrasted polemics and extreme concerns with christian-democratic consensus and solution finding. The FDP/PLR praised the long-term funding of transport infrastructure as the greatest merit of the departing head of the Department of the Environment, Transport, Energy and Communications. SVP/UDC President Albert Rösti praised the willingness of Doris Leuthard to engage. Leuthard has always been able to differentiate between people and the content of their positions. This was ultimately Leuthard's recipe for success. SP/PS faction leader Roger Nordmann described Leuthard as an extraordinary Federal Councilor and state woman. With the nuclear phase-out and the energy turnaround, she has shaped the recent history of Switzerland.

<http://swissinnovation.org/news/web/2018/00-180927-45>



## 1. Policy

### Federal Councilor Johann N. Schneider-Ammann Introduces Incoming State Secretary

(admin.ch, August 23, 2018)

On 23 August, Federal Councilor Johann N. Schneider-Ammann presented Martina Hirayama to the media in Bern. The new State Secretary for Education, Research and Innovation appointed in July will take up her post in January. In her first outing before the assembled political correspondents the State Secretary designate cited three key points. She considers digitalization to be a great opportunity, but in order to be able to reap the benefits, the Swiss population needs future-oriented education and training and the country must have sound infrastructure and a clear legal framework. Future ERI-policy priorities will have to be defined and formulated in close cooperation with all partners and relevant sectors. It is also essential to continue to encourage Swiss ERI actors to participate in international cooperation, which provides enriching exchanges and competition in terms of innovation.

<http://swissinnovation.org/news/web/2018/01-180823-6f>



## State Secretary Dell'Ambrogio Pays Official Visit to Belgium

(admin.ch, September 18, 2018)

The State Secretary for Education, Research and Innovation, Mauro Dell'Ambrogio, paid an official visit to Brussels, where he met Secretary of State Zuhal Demir, who is responsible for the federal government's science policy. State Secretary Dell'Ambrogio also attended an event on vocational education and training together with the Flemish vice-minister-president and education minister, Hilde Crevits. The visit provided an opportunity to emphasize the excellent level of cooperation between the two countries in the field of research and innovation. Belgium is a long-standing scientific partner; bilateral cooperation is mainly supported through the European Union's framework programmes on research and innovation. During the meeting with his Belgian counterpart, Secretary of State Zuhal Demir, Dell'Ambrogio discussed the fruitful collaboration within the European framework programmes, but also in the field of space affairs and polar research. Discussions between State Secretary Dell'Ambrogio and Vice-Minister-President Crevits focused on vocational education and training.

<http://swissinnovation.org/news/web/2018/01-180918-86>

## Participation in the European Framework Programmes for Research

(admin.ch, September 20, 2018)

A report on Switzerland's involvement in the eighth European Framework Programme for Research and Innovation (Horizon 2020; 2014–2020) published by the State Secretariat for Education, Research and Innovation (SERI) shows that participation has recovered since 2016, but is weaker overall than in the previous programme generation (2007–2013). In the seventh programme (FP7), participations made up 3.2% of the total, whereas under Horizon 2020 this figure currently stands at 2.4%; Switzerland's share of coordinations has similarly fallen (3.9% to 2.6%); and funding received by Swiss research institutions has decreased from 4.3% to 3.5% of all funds committed in the current programme. However, Switzerland's thematic and institutional involvement in Horizon 2020 is very similar to that in FP7, with a slight increase in the involvement of the ETH Domain and of small and medium-size enterprises. Moreover, the quality and thus the success rate of research proposals from Switzerland remain very high.

<http://swissinnovation.org/news/web/2018/01-180920-79>

## 2. Education

### International Scholarships for Higher Education Have Positive Impact

(admin.ch, August 14, 2018)

Researchers from around 100 countries who received Swiss Government Excellence Scholarships for Foreign Scholars and Artists in the past 20 years were asked to take part in a survey to determine their career trajectories, geographical mobility and ties to Switzerland. The study comes to a positive conclusion: the 'Swiss Government Excellence Scholarships' promote scientific exchange and contribute to long-term relationships.

<http://swissinnovation.org/news/web/2018/02-180814-89>

### Increased Exchange Opportunities Between Switzerland and China

(University of Zurich, September 10, 2018)

Ties between the University of Zurich and Shanghai Jiao Tong University in China have become stronger with the signing of a university-wide agreement. The agreement in particular supports student exchanges between the two universities. Michael Hengartner, President of the University of Zurich, and Lin Zhongqin, President of Shanghai Jiao Tong University, met at swissnex China in Shanghai on 7 September to sign a new exchange agreement. The agreement extends the already existing cooperation between the



University of Zurich Institute of Banking and Finance and the Shanghai Advanced Institute of Finance to a university-wide level. The signing ceremony was attended by Swiss education minister Johann Schneider-Ammann as well as an official delegation of the Swiss State Secretariat for Education, Research and Innovation and representatives of the two universities.

<http://swissinnovation.org/news/web/2018/02-180910-de>

## Boom in Number of Students and Women at ETH Zurich

(ETH Zurich, September 13, 2018)

The interest in ETH Zurich programmes has never been greater than in 2018. With 4,500 new students at Bachelor and Master level, the number of students has surged to over 21,000, a new record! The 4,300 doctoral students and students in continuing education help to achieve this record high. At Bachelor level, ETH Zurich welcomed 3,080 new students on its 24 degree programmes (previous year 3,016). Despite a decline of 10% compared to the previous year, Mechanical Engineering is still the largest study programme with 441 admissions. Computer Science has caught up fast with 376 admissions (+14%). Architecture, also traditionally in high demand, ranks third with 295 students. Encouragingly, the proportion of women at Bachelor level has grown to 36%, compared to 33.7% in the previous year. The proportion of foreign students has risen slightly to 14% (previous year 12.8%).

<http://swissinnovation.org/news/web/2018/02-180913-1c>



## Number of Students at University of Zurich Remains High

(University of Zurich, September 13, 2018)

Around 26,500 students have enrolled for the Fall Semester 2018 at University of Zurich, which is roughly the same as in the Fall Semester last year (2017: 26,472). The number of students enrolled in Bachelor's degree programs has remained constant at 13,560, while there has been an increase of 4% among Master's students compared to last year (2018: 6,457). A total of 5,150 scholars are studying towards their doctoral degree (2017: 5,324). At 58%, the percentage of women is unchanged, as is the share of students from abroad, at 19%. "These figures show that the University of Zurich is as attractive as ever, at all academic levels," says Prof. Gabriele Siegert, Vice President Education and Student Affairs. Also, the University Program for School Students has got off to a good start with 37 registrations.

<http://swissinnovation.org/news/web/2018/02-180913-31>



## University of Basel and ETH Zurich Combine Cutting-Edge Research in Pediatrics

(University of Basel, September 19, 2018)

The University of Basel and ETH Zurich co-founded the Botnar Research Centre for Child Health (BRCC) in Basel. They bring together top scientists and clinical researchers from a variety of disciplines in order to develop new methods and digital innovations for global use in pediatrics. The Research Centre's network also includes partner institutions such as the University Children's Hospital Basel and the Swiss Tropical and Public Health Institute in Basel. It combines the expertise of both universities in systems biology, medicine and various areas of life sciences, engineering, social sciences and information technology that are relevant to health. The BRCC is funded by a CHF 100 million contribution from Fondation Botnar in Basel.

<http://swissinnovation.org/news/web/2018/02-180919-b2>



## Doctorate of Advanced Professional Studies

(University of Geneva, September 25, 2018)

The University of Geneva has joined forces with Tsinghua University, one of China's most prestigious universities, to create a doctorate of advanced professional studies in finance in the field of wealth management, for which it assumes scientific responsibility. This pilot project is designed primarily for Chinese entrepreneurs or company directors with a master's degree and at least five years' professional experience, but it is also open to candidates coming from Switzerland. The ten course modules take place in Beijing with half of the teachers coming from University of Geneva and half from Tsinghua University, they are given in English with simultaneous translation into Mandarin and supported by bilingual materials. They are part of a three-year curriculum, during which the doctoral student's professional thesis is systematically co-directed by a University of Geneva professor and a Tsinghua University professor.

<http://swissinnovation.org/news/web/2018/02-180925-79>



## International VPET Congress

(SERI News, September 25, 2018)

This summer international experts gathered for the third International Congress on Vocational and Professional Education and Training (VPET) in Switzerland. Set up to strengthen vocational education and training internationally, over the years the congress has become established as a platform for networking and exchange in this field. The congress motto, Skills for Employability and Careers, gave rise to discussions on core topics and current issues in VPET. The focus was on how to equip vocational training systems for the future. The International VPET Congress was set up by SERI as part of its programme of international cooperation in VPET, with the strategic aim of strengthening Swiss VPET in an international context. The idea was to promote the transfer of expertise by creating a platform for open discussion and networking, and by establishing ease of access to information on the Swiss VPET system.

<http://swissinnovation.org/news/web/2018/02-180925-e2>



## Supporting the next Generation of Researchers

(SERI News, September 25, 2018)

Supporting the next generation of researchers is among the priorities of federal policy in the area of education, research and innovation for 2017–2020. In pursuit of this objective, SERI provides targeted funding to actors that help young people in Switzerland to compete with the world's best for scientific excellence in their field. The Science Olympiad Switzerland Association is one such actor. It allows young people between the ages of 14 and 19 to take part in national and international science competitions. The International Science Olympiads movement began with school competitions in Europe back in the 1960s. Switzerland sent its first delegation to the International Chemistry Olympiad in 1987. Today, the Olympiads have become a truly international event. Awakening enthusiasm for science Switzerland now has Science Olympiads in eight disciplines: Biology, Chemistry, Geography, Information Technology, Mathematics, Philosophy, Physics and Robotics.

<http://swissinnovation.org/news/web/2018/02-180925-5c>



## THE World University Rankings 2019

(Times Higher Education, September 28, 2018)

The Times Higher Education (THE) World University Ranking (Times Ranking) is one of three main ranking lists used to compare higher education institutions worldwide, with the Shanghai Ranking and the QS Ranking. The Times Ranking is drawn up on the basis of 13 criteria relating to matters such as teaching, research, innovation and international aspects. With its 11th rank the ETH Zurich remains the best university outside the Anglo-



Saxon countries. The top 200 institutions include EPFL (35th), the University of Zurich (90th; largest jump), the University of Basel (103rd), the University of Bern (110th), the University of Geneva (135th) and the University of Lausanne (176th). Next come the University of Fribourg (between 201st and 250th place), the University of St. Gallen (between 401st and 500th place) and the University of Neuchâtel (between 501st and 600th place).

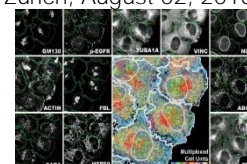
<http://swissinnovation.org/news/web/2018/02-180928-3a>

### 3. Life Sciences / Health Care

#### New Method Refines Cell Sample Analysis

(University of Zurich, August 02, 2018)

Researchers at the University of Zurich have developed a novel method for analyzing cells and their components called Iterative Indirect Immunofluorescence Imaging (4i). This innovation greatly refines the standard immunofluorescence imaging technique used in biomedicine and provides clinicians with an enormous amount of data from each individual sample. 4i makes it possible to observe the spatial distribution of at least 40 proteins and their modifications in the same cell for hundreds of thousands of cells simultaneously at various levels, from the tissue down to the organelle level. “4i is the first imaging technique which gives us a multiplexed tissue-to-organelle view of biological samples. We can, for the first time, link multiplexed information derived at the tissue, cellular and subcellular level in one and the same experiment,” says Gabriele Gut from University of Zurich.



<http://swissinnovation.org/news/web/2018/03-180802-58>

#### Potential Early Dementia Detection

(University of Basel, August 08, 2018)

The normal functioning of cells is based on the interaction of different organelles. In many cases, an impaired communication will activate a stress response. The relation between this stress response in neurons and dementias has now been demonstrated by researchers at the University of Basel and the University Hospital Basel, in collaboration with the Universities of Cambridge and Padua. The team of neuropathologists found that disturbances of the mitochondria trigger stress reactions that lead to the release of fibroblast growth factor-21 (FGF21). This protein could thus be a suitable biomarker for the pre-symptomatic detection of neurodegenerative diseases such as Alzheimer's or Parkinson's. Since FGF21 can also be produced by adipose tissue and the liver, however, further testing will be required.

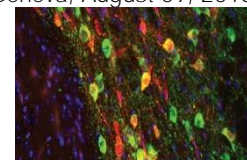


<http://swissinnovation.org/news/web/2018/03-180808-62>

#### Synapses of Reward System at Stake in Autistic Disorders

(University of Geneva, August 09, 2018)

Autism spectrum disorders are a heterogeneous group of neurodevelopmental disorders, one of the main characteristics of which is impaired social communication. But what happens in patients' brains that disrupts their social skills? According to scientists from the Universities of Geneva and Basel, a malfunction of the synaptic activity of neurons present in the reward system seems to be at stake. By establishing a link between a genetic mutation found in people suffering from autistic disorders, a disturbance of the synapses and an alteration of social interactions, they are taking one step further in the understanding of a disorder that affects more than one child in 200 today.



<http://swissinnovation.org/news/web/2018/03-180809-21>



## New Approach to Treating Chronic Itch

(University of Zurich, August 13, 2018)

Researchers at the University of Zurich have discovered a new way to alleviate itch. They used an experimental drug to boost the effect of specific neurons in the spine that prevent itch signals from being relayed to the brain. The scientists had previously located and described these neurons three years ago. Since then, they have used genetic mouse models to identify two specific receptors that control the effect of the spinal neurons. These receptors are part of a large group of receptors that is activated by the amino acid transmitter gamma-aminobutyric acid, or GABA. The experimental drug used by the researchers in their study interacts with the two identified receptors. In their experiments, the pharmacologists were able to show that it not only suppresses acute itch but is also effective against chronic itch.



<http://swissinnovation.org/news/web/2018/03-180813-5d>

## Brain Suppresses the Act of Revenge

(University of Geneva, August 21, 2018)

The desire for revenge can be the consequence of a feeling of anger. But is this the case at the cerebral level? What happens in the human brain when injustice is felt? To answer these questions, researchers from the University of Geneva have developed an economic game in which a participant is confronted with the fair behavior of one player and the unfair provocations of another player. They then observed, through brain imaging, which areas were activated as the study participant experienced unfairness and anger. In a second phase, scientists gave the participant the opportunity to take revenge. They thus identified the location in the brain of activation related to the suppression of the act of revenge in the prefrontal dorsolateral cortex (DLPFC). The more active the DLPFC is during the provocation phase, the less the participant takes revenge.



<http://swissinnovation.org/news/web/2018/03-180821-dc>

## Effect of Phosphate Intake on Blood Pressure in Healthy Adults

(University of Basel, August 23, 2018)

Phosphates are a common additive in industrially produced food. Increased consumption of processed food has significantly increased phosphate intake in recent years, which now often exceeds the daily intake of 700 mg recommended in the US. It has been shown by epidemiological studies, that an increase in dietary phosphate increases the likelihood of developing or even dying from arteriosclerosis or a cardiovascular disease in healthy people. A research team from the University of Basel has shown that increased phosphate intake indeed increases blood pressure in healthy young adults. The study also demonstrated the effect to be reversible. The findings have been published in the Journal of the American Society of Nephrology.

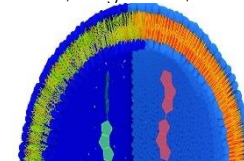


<http://swissinnovation.org/news/web/2018/03-180823-01>

## Measuring Cell Tension Using Fluorescent Molecule

(University of Geneva, August 27, 2018)

Cells have evolved mechanisms to monitor the tension of their plasma membrane. When tension is too high, cells respond by increasing the amount of lipid in the membrane. When tension is too low, cells remove lipid from the membrane. Researchers from the University of Geneva and the National Centre for Competence in Research Chemical Biology have created a fluorescent molecule to measure the tension of the plasma membrane of live cells. Using this new tool, they were able to discover how cells adapt their surface to their volume. These results, published in Nature Chemistry and Nature Cell Biology, pave the way for many applications, including in the detection of cancer cells that typically display aberrantly high membrane tension.



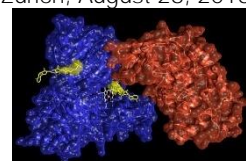
<http://swissinnovation.org/news/web/2018/03-180827-36>

## Protein Modifications that Point to Cancer

(University of Zurich, August 28, 2018)

Cells use different signals to react to stress and to inform other body cells. Triggers are, for example, cancer or inflammatory diseases. A central signaling pathway of stress response is the modification of proteins called ADP-ribosylation. Small molecules (ADP ribose) are added to precisely defined protein sites to control protein function. Researchers at the University of Zurich have developed a method with which they can, for the first time, use tissue samples to investigate all proteins outside the cells that carry ADP-ribosylation as modification. With the identification of this ADP-ribosylome, the exact positions at which the proteins were modified, can also be determined. These data allow conclusions to be drawn about activated signaling pathways in the cells. Together with the University Hospital Zurich, the researchers are now testing the new method to diagnose and treat cancer.

<http://swissinnovation.org/news/web/2018/03-180828-07>

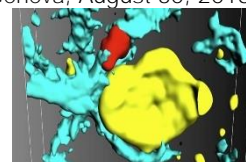


## Neurons Turn Against Themselves

(University of Geneva, August 30, 2018)

Rasmussen's encephalitis is a rare autoimmune disease that primarily affects children and can lead to seizures. As the disease is resistant to drug treatments, it frequently requires surgical interventions aiming to remove or disconnect the affected part of the brain. Researchers from the University of Geneva and the Geneva University Hospitals have now succeeded in describing and mastering the mechanisms at work within neurons in mice. It was previously thought that neurons were the target of immune system cells that attack synapses (the connections between neurons). But the researchers have discovered that the neurons themselves play an active role in triggering this process. "Following the attack by CD8+ T lymphocytes of the immune system, which fight against viral infections, the neuron produces a chemical signal to other cells called phagocytes which then attack the synapses. It's a sort of tripartite tango with tragic consequences", explains Doron Merkler.

<http://swissinnovation.org/news/web/2018/03-180830-21>

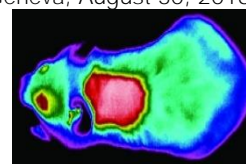


## Gut Bacteria's Role in Obesity Treatment

(University of Geneva, August 30, 2018)

Eating less calories is healthy. We all know it, and it has long been proven. A team led by the University of Geneva and involving researchers of the University Hospital Bern and the Swedish company AstraZeneca IMED Biotech Unit wished to better understand the role of gut bacteria in obesity. They restricted the calorie intake of mice for 30 days and found an increased amount of beige fat in the animals, a tissue that burns body fat and contributes to weight loss. When they transferred intestinal microbiota from the calorie-restricted mice to others, the receiving animals also developed more beige fat and were leaner while eating normally. The reason, they found, is that gut bacteria of mice on a low-calorie diet produces less Lipopolysaccharide (LPS), a toxic molecule. When LPS-levels were put back to normal levels, the mice lost most health benefits of the diet. Thus, the team hopes to someday develop a drug that mimics the effect of calorie restriction by artificially reducing the LPS in the blood.

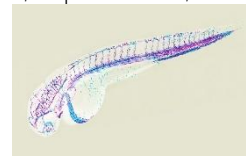
<http://swissinnovation.org/news/web/2018/03-180830-0f>



## Cells Form New Blood Vessels Like a Zipper

(University of Basel, September 03, 2018)

Blood vessel formation relies on the ability of vascular cells to move while remaining firmly connected to each other. This enables the vessels to grow and sprout without leaking any blood. Scientists from the Biozentrum at the University of Basel have





investigated in detail how this works. In this process, the cytoskeleton pushes the cell forward, while an adhesion protein subsequently closes the gap to the neighboring cell, like a zipper.

<http://swissinnovation.org/news/web/2018/03-180903-29>

## B Cells Among Factors Leading to Brain Lesions in Multiple Sclerosis

(University of Zurich, September 04, 2018)

Multiple sclerosis (MS) is a chronic autoimmune disease of the central nervous system. The body's own immune cells attack and damage the layer that surrounds nerve cells in the brain and spinal cord, which impedes their ability to communicate with each other. MS can lead to severe neurological disabilities such as sensory problems, pain and signs of paralysis. Researchers from University of Zurich, the University Hospital Zurich and Karolinska Institute (Sweden) have now shown that in multiple sclerosis, it is not only specific T cells that cause inflammation and lesions in the brain. B cells, a different type of immune cell, also play a role. These cells activate T cells in the blood. This discovery explains how new MS drugs take effect, opening up novel options for treating the disease.



<http://swissinnovation.org/news/web/2018/03-180904-27>

## Biomarkers Indicating Whether Patients Respond to Immunotherapy

(University of Zurich, September 06, 2018)

Burkhard Becher, researcher at University of Zurich, considers immunotherapy one of the most promising approaches in cancer treatment. A large-scale study in 2010 showed that melanoma can be successfully treated with an immunotherapy. The cure rate has since shot up and is currently at 40-50%. However, for around half of the patients suffering from melanoma, immunotherapies have had no effect. Researchers from University of Zurich and University Hospital Zurich have used a novel method to find out which patients are likely to respond to an immunotherapy, and which are not. They managed to identify molecules (or biomarkers) that indicate whether a treatment will be effective. Using a complex ultramodern cytometric procedure, the scientists examined up to 50 proteins in every single cell in blood samples taken from patients. They then analyzed the molecular patterns with the help of an algorithm developed by bioinformatics specialists.

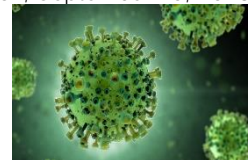


<http://swissinnovation.org/news/web/2018/03-180906-a6>

## Special Antibodies Could Lead to HIV Vaccine

(University of Zurich, September 10, 2018)

A small number of people who are infected with HIV-1 produce very special antibodies. These antibodies do not just fight one virus strain but neutralize almost all known virus strains. Research into developing an HIV vaccine focuses on discovering the factors responsible for the production of such antibodies. A research team led by the University of Zurich and University Hospital Zurich has been searching for these factors for years. Several factors have already been identified: For example, the virus load and the diversity of the viruses, the duration of the infection, and the ethnicity of the affected person can all influence the body's immune response. "In our new study, we were able to identify another factor: The genome of the HI virus", says Huldrych Günthard from University Hospital Zurich.

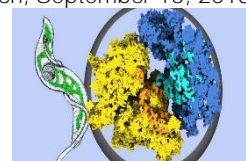


<http://swissinnovation.org/news/web/2018/03-180910-a3>

## Special Structure of Trypanosomal Mitoribosomes

(ETH Zurich, September 13, 2018)

Research groups from ETH Zurich and the University of Bern used electron cryo microscopy in order to obtain the atomic-resolution structure of a very unusual ribosome present in the mitochondria of a sleeping sickness-causing parasite. The researchers found that mitoribosomes of trypanosomes are larger than any other ribosome, including the ones found in humans. As their structure deviates substantially from that of human ribosomes, they represent a promising drug target to potentially treat sleeping sickness. Comparison between the structures of human and trypanosomal mitochondrial ribosomes could be therefore useful for the identification of selective inhibitors to treat diseases caused by trypanosomes. The study appeared in the latest issue of Science.



<http://swissinnovation.org/news/web/2018/03-180913-73>

## Resynchronizing Neurons to Erase Schizophrenia

(University of Geneva, September 17, 2018)

Schizophrenia, an often severe and disabling psychiatric disorder, affects approximately 1% of the world's population. While research over the past few years has suggested that desynchronization of neurons may be the cause of its neuropsychiatric symptoms, such as memory disorders, hyperactivity or hallucinatory phenomena, the cellular origin of such desynchronization remains poorly understood. A decisive step in understanding this disease has now been taken: Researchers at the University of Geneva have succeeded not only in deciphering a cellular mechanism leading to the desynchronization of neural networks, but also in correcting this organizational defect in an adult animal model, thereby suppressing abnormal behaviors associated with schizophrenia. Results show that a therapeutic intervention is possible at all ages.



<http://swissinnovation.org/news/web/2018/03-180917-be>

## Neuronal Activity When Deciding Between Doing a Physical Activity and Doing Nothing

(University of Geneva, September 18, 2018)

About 30% of adults and 80% of teenagers do not meet the minimum levels of daily physical activity for staying healthy, as recommended by the WHO. Previous studies have demonstrated that there is a gap between the intention to play sport and actually playing it among individuals with a leaning towards a sedentary lifestyle. Researchers at the University of Geneva and the University Hospitals of Geneva have studied the neuronal activity of people faced with making the choice between physical activity and doing nothing. They noted that the brain requires far greater resources to escape a general attraction to minimizing effort. A struggle then breaks out between the desire to do nothing and the physical activity. The results are consistent with the idea that our ancestors had to avoid unnecessary physical effort to increase their chances of survival.



<http://swissinnovation.org/news/web/2018/03-180918-54>

## Restoring Tactile Information to People with Limb Amputation

(EPFL, September 21, 2018)

Over the years, various solutions have been developed to restore tactile information to people with limb amputation. However, this information is still far from those of the human hand in terms of naturalness and effectiveness. The solution to this important clinical and scientific problem is in a new research by a group of researchers from EPFL, from the University of Freiburg in Germany and of the Policlinico Gemelli in Rome. The working group has in fact developed a code capable of transmit for the first time to the nerves of the amputated arm all the variety of perceptions that it would have received from the nerve fibers connected to the tactile receptors of one's hand and then communicate the information useful for the movement in an extremely natural way.



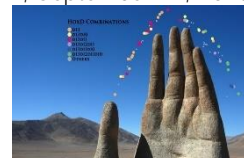
<http://swissinnovation.org/news/web/2018/03-180921-73>

## Gene Code of Growing Limbs

(EPFL, September 21, 2018)

When a fetus develops, everything must be timed to perfection: cell division and differentiation, gene expression, cell-to-cell signaling, and morphogenesis must be carefully coordinated to occur in the correct sequence and for the proper amount of time. Failures in timing can result in congenital deformities, disabilities, and even death. Looking at the development of the paw and digits in mice, scientists at EPFL and University of Geneva have discovered a “code” of architect genes that play a central role in the developmental cascade. The genes belong to the Hoxd group, developmental genes that are active in various combinations inside so-called “progenitor” cells – cells that are just a step more specialized than stem cells.

<http://swissinnovation.org/news/web/2018/03-180921-ee>



## Genome Duplication Drives Evolution of Species

(University of Zurich, September 25, 2018)

Many wild and cultivated plants arise through the combination of two different species. The genome of these so-called polyploid species often consists of a quadruple set of chromosomes, a double set for each parental species, and thus has about twice as many genes as the original species. About 50 years ago, evolutionary biologists postulated that this process drives evolution, leading to new species. Due to the size and complexity of such genomes, however, proving this theory on a genetic level has been difficult. An international research team headed by scientists from University of Zurich has now been able to provide the experimental confirmation of this theory. They used the plant species *Arabidopsis kamchatica*. They sequenced the genome of 25 different individuals of the polyploid species from various regions around the world, as well as 18 different individuals of its parental species.

<http://swissinnovation.org/news/web/2018/03-180925-20>



## Post-Infectious Cough Untreatable with Drugs

(higgs.ch, September 27, 2018)

Even if colds are over after a few days, a troublesome cough often lasts much longer. This so-called post-infectious cough lasts for three to eight weeks, which drives many concerned people to doctors. Some primary care physicians prescribe medications, including inhaled sprays with corticosteroids for asthma or cough suppressants such as codeine. So far, it was not clear whether post-infectious cough really disappears faster or weakens with the use of the drugs. That is why researchers from the University of Basel have systematically examined the literature. They evaluated studies that had investigated the efficacy of various substances in post-infectious cough, only including studies comparing a drug with a placebo. A total of seven drugs were targeted, including codeine and various corticosteroids for asthma. The analysis showed that none of the tested substances work.

<http://swissinnovation.org/news/web/2018/03-180927-ba>

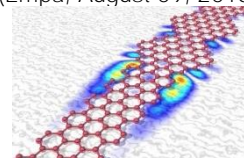


## 4. Nano / Micro Technology / Material Science

### Quantum Chains in Graphene Nanoribbons

(Empa, August 09, 2018)

A material that consists of atoms of a single element but has completely different properties depending on the atomic arrangement – this may sound strange, but is actually reality with graphene nanoribbons. The ribbons, which are only a few carbon atoms wide and exactly one atom thick, have very different electronic properties





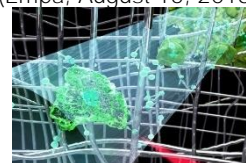
depending on their shape and width: conductor, semiconductor or insulator. An international research team led by Empa researchers has now succeeded in precisely adjusting the properties of the ribbons by specifically varying their shape. The particular feature of this technology is that not only can the "usual" electronic properties mentioned above be varied – it can also be used to generate specific local quantum states.

<http://swissinnovation.org/news/web/2018/04-180809-71>

## Development of Artificial Tissues Controlled by Light for Pharmaceutical Research

(Empa, August 15, 2018)

In pharmaceutical research, scientists try to do without animal testing wherever possible or replace it with experiments on cell or tissue cultures. A team at Empa has now developed a kind of scaffold, in which cells can spread, multiply and interconnect. The innovative aspect about the new matrix: the precision of the desired form and function is controlled by light. The new material consists of a gel, for which a light-sensitive mechanism can be used to incorporate a large number of functional groups into its polymer structure. The hydrogel is not only ideal to develop alternatives to animal testing, investigating diseases and improving the understanding of cell growth are also among the fields of application for this novel material.

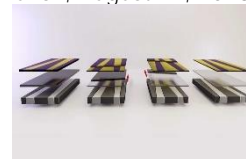


<http://swissinnovation.org/news/web/2018/04-180815-e6>

## Inversion in One Go

(ETH Zurich, August 22, 2018)

Multiferroics are materials that have both magnetic and electrical order. Thus, they align both along magnetic and electric fields. ETH Zurich researchers have discovered how the magnetic and electric structure of such materials can be turned into their opposites using a single magnetic field pulse. "That's as if we inverted every single bit on a hard disk in one go", lead author Prof. Manfred Fiebig said. The mechanisms that bring about the order inside the material are coupled to each other, which makes it possible to influence the magnetization not through magnetic fields, as usual, but by electric fields too. This mechanism could save a lot of energy, since the creation of magnetic fields with electric current can be omitted.

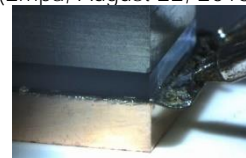


<http://swissinnovation.org/news/web/2018/04-180822-82>

## Joining Technology with Reactive Nano-Multilayers

(Empa, August 22, 2018)

Reactive nano-multilayers are considered to be a revolution in joining technology. They are envisaged for joining heat-sensitive materials that would otherwise be damaged or even destroyed upon conventional soldering. But soldering with reactive foils proves to be tricky due to the volatile nature of the reactive foils. Empa researchers have now succeeded in refining the joining process with reactive nano-multilayers, making it available also for sensitive components without any loss in quality. The process is specifically adapted to the properties of the respective materials, for example by carefully choosing the type and thickness of the reactive foil, or the amount of solder. "We can even join copper with glass without damage from heat or thermal stress," explains Empa researcher Bastian Rheingans. The researchers now want to make this know-how available to industry and give support in the development of complex processes.



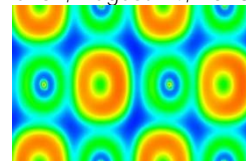
<http://swissinnovation.org/news/web/2018/04-180822-35>

## Uncovering Atomic Symmetry

(ETH Zurich, August 24, 2018)

Material scientists at ETH Zurich have resolved a poorly understood phenomenon related to the heating of lead telluride (PbTe). A few years ago, scientists argued about a process that increases the symmetry in the material when it is heated, called *emphanisis*. Using simulations on the CSCS supercomputer and an X-ray scattering technique providing high-precision visibility of the atomic structure, the team showed that the symmetry is broken locally, but retained when viewed as a whole. Heating the crystal leads to strong acoustic and optical vibrations that are coupled together. This creates correlated dipoles, with pairs of Pb and Te atoms both fluctuating according to their charges. The researchers suspect that this process is essential for PbTe's thermoelectric behavior (meaning that it can convert heat into electrical energy) and therefore the findings will help to find more efficient thermoelectric materials in the future.

<http://swissinnovation.org/news/web/2018/04-180824-fb>



## Patches with Light Switch

(Empa, September 10, 2018)

Researchers at Empa and at the University of Fribourg are currently developing a system, with which the effect of drugs can be controlled by light switches. The molecular light switch is inspired by nature. Like the natural pigments in the eye, these synthetic photochromes can also be activated by light. The molecular switches were integrated into polymer nano-spheres, which were filled with test substances for initial experiments. When these nano-reactors are exposed to light of a certain wavelength, they change their structure. Thus, their surface becomes permeable and the chemically active substances can diffuse from the nano-reactor into the environment, for example through a "transdermal" patch. If the color of the light changes, the chemical reaction stops within seconds. The shell of the nano-reactors turns impermeable and the reaction vessels are ready for the next use.

<http://swissinnovation.org/news/web/2018/04-180910-0f>



## Aerating Gluten-Free Dough

(ETH Zurich, September 12, 2018)

Gluten is a long-chain protein that can be shaped into elastic strands under mechanical pressure (e.g. kneading). When the dough is baked, these strands ensure that the expanding vapor bubbles inside retain a relatively intact porous structure, enabling the bread to rise properly. In gluten-free dough, the bubbles burst sooner, leading to significantly reduced expansion. Previously, this problem was partially alleviated by adding emulsifiers and thickening agents to the dough, but this came at the expense of natural, healthy nutrition, and diminished the flavor of the finished product. ETH Zurich researchers came up with the idea of aerating the gluten-free dough using an extruder they previously developed in order to deliver most of the desired foam structure and volume to the rusks before baking. The subsequent baking process would then serve merely to lend the foam the required firmness and to extract moisture.

<http://swissinnovation.org/news/web/2018/04-180912-93>



## 5. Information & Communications Technology

### Monitoring Noisy Processes with Help of AI

(Empa, August 29, 2018)

An Empa team monitors noisy processes with the help of artificial intelligence. This way you can literally hear production errors and imminent accidents. The aforementioned partner is Selfrag AG from Kerzers near Bern. The company manufactures high-voltage generators, which can pre-weaken or even break concrete using lightning discharges. The Empa scientists started bombarding small test pieces made of Plexiglas with high-voltage lightning bolts. The acoustic signature of every lightning bolt was recorded, and the corresponding Plexiglas test piece examined for cracks and surface damage under the microscope. Then they tested a number of different strategies to recognize revealing patterns from the data. Eventually, not only did they succeed in distinguishing successful lightning strikes from misses, but also in spotting surface hits. For the first time, this gave Selfrag an online monitoring possibility for its lightning technology.

<http://swissinnovation.org/news/web/2018/05-180829-ce>

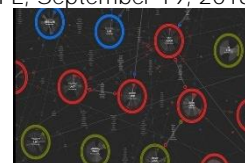


### Tool for Visualizing Academic Synergies

(EPFL, September 19, 2018)

Scientists around the world are excited about the new possibilities being offered by advanced data collection and processing methods. But making such data understandable and useful to the uninitiated remains a challenge. With its Affinity Map, EPFL's School of Architecture, Civil and Environmental Engineering hopes to give its faculty a tool for better leveraging the vast amount of data related to their research and teaching. The Affinity Map is designed to help researchers spot potential academic synergies, topics they share with colleagues and possible areas for joint research. The map is fast, intuitive to use and now available to the general public. "This public version is intended to show academic community the potential of data visualization and how it can help encourage research collaboration on a global level," says Dario Rodighiero from EPFL.

<http://swissinnovation.org/news/web/2018/05-180919-af>



### Software Analyzes Dysgraphia

(EPFL, September 28, 2018)

Trouble learning how to write, called dysgraphia, affects some 10% of schoolchildren. This learning disability is often associated with dyslexia and can appear in children to varying degrees, with causes that can differ from one child to the next. A team of researchers at EPFL has developed software that enables doctors to make highly detailed, personalized assessments of this disability and to accurately identify the letters and numbers that are most difficult and are thus the most discriminative. The test, called Tegami, which is run using a tablet computer, represents a major step forward in terms of analytical precision and accuracy of input. It was developed from a database of writing samples from 300 children, around 25% of whom suffered from dysgraphia. The program was able to detect the learning disability 98% of the time.

<http://swissinnovation.org/news/web/2018/05-180928-e8>





## 6. Energy / Environment

### Global Warming: Far Greater Risks Seen in the Past

(University of Geneva, August 06, 2018)

56 million years ago, the Earth experienced an exceptional episode of global warming. In a very short time on a geological scale, the average temperature increased by 5 to 8 degrees, only returning to its original level a few hundred thousand years later. Based on the analysis of sediments from the Pyrenees, researchers from the University of Geneva measured the impact of this warming on river floods and the surrounding landscapes and found that vegetated landscapes may have been replaced by arid pebbly plains. Their study proves that the risks associated with global warming may be far greater than we generally think.

<http://swissinnovation.org/news/web/2018/06-180806-9a>



### Marine Heatwaves are Threatening Ecosystems

(University of Bern, August 15, 2018)

Extreme events in the ocean have only recently started to be discussed as consequences of climate change. Extreme events such as repeated marine heatwaves can irreversibly damage ecosystems. Researchers from the University of Bern and the ETH Zurich have shown in a study that the number of marine heatwaves has increased dramatically in past decades. The biological consequences of intensified marine heatwaves can be far-reaching: from a wide-spread change to species composition, through geographical species shifts, to harmful algal bloom, stranding of mammals and mass mortalities of particular species. Furthermore, marine heatwaves already caused considerable losses for the fishing industry.

<http://swissinnovation.org/news/web/2018/06-180815-b4>



### Expansion and Ecological Limits of Pumped-Storage Hydropower

(Eawag, August 15, 2018)

Eawag researchers have studied how various pumped-storage hydropower scenarios affect temperature and water quality in the waterbodies concerned. The researchers sought to disentangle the effects of deepwater withdrawal from those of pumped-storage operations. The results of the simulations showed that deep water withdrawal can itself have substantial effects. The water temperature in the lower layer of the reservoir is markedly increased, oxygen depletion is reduced, and nutrient concentrations are affected as a result. However, deep water withdrawal cannot explain all the differences: water temperature and oxygen and nutrient concentrations are also influenced by the exchange of water between the two waterbodies and by differences in temperature and concentrations between the intake in one lake and the outlet in the other.

<http://swissinnovation.org/news/web/2018/06-180815-05>



### Western Corn Rootworm Absorbs Iron from Maize

(University of Bern, August 16, 2018)

The struggle for iron determines the fate of maize and insect pest: Maize plants release secondary metabolites into the soil that bind to iron and thereby facilitate its uptake by the plant. The Western corn rootworm, the economically most important maize pest worldwide, is attracted by these complexes, extracts the bound iron from the maize plant and uses it for its own nutrition. With these insights, researchers from the University of Bern and the Max Planck Institute for Chemical Ecology in Jena, Germany, provide a new explanation for the extraordinary success of the Western corn rootworm as a global maize pest.

<http://swissinnovation.org/news/web/2018/06-180816-86>



## A Hazard Map for Fluoride in India's Groundwater

(Eawag, August 16, 2018)

Groundwater naturally contains fluoride, and in small amounts this does not pose a risk to human health. In many places in India, however, the concentration exceeds the threshold, set at 1.5 milligrams per liter by the WHO. An excess consumption can lead to growth disorders, teeth damage and bone deformation. In a study partly financed by the Swiss Agency for Development and Cooperation, Eawag researchers developed a computer model based on 13,000 Indian fluoride measurements to determine the extent of fluoride-contaminated groundwater. According to the model, there are more than a hundred million people that could be affected. Even though the resolution of the hazard map is not high enough to predict the safety of a certain well, it allows for specific analyses and measures in high-risk areas.

<http://swissinnovation.org/news/web/2018/06-180816-f2>



## Species-Rich Forests Better Compensate Environmental Impacts

(University of Zurich, August 22, 2018)

Until now there has been little research into whether the number of tree species in a forest has an influence on the carbon cycle in the ecosystem. Researchers from Switzerland, Germany and China, including some from University of Zurich, have now collated comprehensive data on 27 forest allotments in the province of Zhejiang in subtropical southeastern China for a period of six years. The researchers discovered that species-rich forests have a faster carbon cycle than those with just a few species. With increased species richness, more carbon is stored both above and below ground in trunks, roots, deadwood, mold and soil. Estimations of the researchers have shown that 6.4% more carbon can be compensated with each additional tree species in an allotment. In addition, older trees accumulate more carbon than younger ones.

<http://swissinnovation.org/news/web/2018/06-180822-af>



## Global Warming Reduces CO2 Intake by Plants

(ETH Zurich, August 29, 2018)

Plants need water to grow. When a drought occurs, and soils dry out, plants reduce photosynthesis and breathe less in order to save water and preserve their tissues. As a consequence, they are no longer able to capture carbon dioxide from the surrounding air. Researchers from the ETH Zurich in collaboration with colleges from France and the United Kingdom, used innovative satellite technology to measure the global sensitivity of ecosystems to water stress. They found the global effect to be so strong that it must be integrated in the next generation of climate models.

<http://swissinnovation.org/news/web/2018/06-180829-c3>



## Modeling Insect Pests in Anticipation of Climate Change

(ETH Zurich, August 29, 2018)

Climate change alters the conditions for the incidence of agricultural pests like bacteria, viruses, fungi and insects. Cultivated plants are already under tremendous pressure from pest organisms, and this pressure will rise if warming continues as predicted. New insect species are steadily spreading across Switzerland and Europe, e.g. the spotted wing drosophila (*Drosophila suzukii*) from south-eastern Asia, first recorded in Switzerland in 2011 and wreaking havoc on berries and other soft fruit. The Swiss National Centre for Climate Services (NCCS) has provided funding to examine the future distribution of insect pests. ETH Zurich and Agroscope researchers are using computer simulations to develop scenarios involving pests and plants important for agriculture and forestry. This modeling will help agriculture stay ahead of potential invaders and plan protective measures.

<http://swissinnovation.org/news/web/2018/06-180829-67>



## How Forests Endure Great Heat Waves

(University of Basel, August 29, 2018)

Between April and August this year, Switzerland experienced the driest summer season since 1864. Forests in particular seem to have suffered from this dry spell, their leaves turning brown as early as August. A study by the University of Basel indicates that native forest trees cope much better with drought than previously expected. Based on a three-year study, the findings show that trees close their pores, preventing damage to their conductive pathways and thus avoiding the risk of desiccation. The researchers found no evidence that the long-lasting pore closure leads to a reduction in the trees' sugar reserves. Nevertheless, a consistently warmer and dryer climate might still put our native forests at risk, by weakening them and making susceptible to insect infestation, for instance.

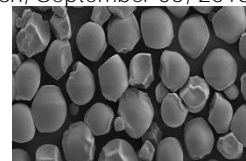


<http://swissinnovation.org/news/web/2018/06-180829-4f>

## New Cassava with Improved Starch

(ETH Zurich, September 05, 2018)

Using the famous CRISPR-Cas9 gene scissors, plant biotechnologists at ETH Zurich have improved cassava. The new variety has amylose-free or 'waxy' starch, which is preferred for applications. Cassava is one of the world's most important starch crops. The storage roots feed more than 500 million people and are used in many other important applications, like paper production or as a food additive. Although cassava plants are hardy and drought-resistant, it is time-consuming to cross-breed useful new traits into different farmer-preferred varieties. In their study published in Science Advances, ETH Zurich researchers tried a new approach – making changes to the crop plant's genome – to introduce new traits into cassava. This method considerably accelerates the cultivation of cassava, and the new cassava should appeal to both consumers and industry.

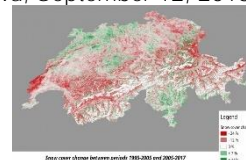


<http://swissinnovation.org/news/web/2018/06-180905-15>

## Snow Is Disappearing in Switzerland

(University of Geneva, September 12, 2018)

In Switzerland, snow is disappearing, and this phenomenon is probably linked to global warming. While areas with little or no snow (between 0 and 20% probability of snowfall) covered 36% of the territory during the decade 1995-2005, they spread to 44% between 2005 and 2017. An increase of 5200 km<sup>2</sup> which is well beyond any margin of error. This irrefutable observation, drawn up by researchers from the University of Geneva and the GRID-Geneva of the United Nations Environment Programme, is based on the preliminary analysis of 22 years of satellite data covering the entire Swiss territory. This study was made possible through the development of a new tool, the Swiss Data Cube, initiated on behalf of the Federal Office for the Environment (FOEN).



<http://swissinnovation.org/news/web/2018/06-180912-96>

## Studying Tsunamis in Switzerland

(ETH Zurich, September 14, 2018)

It has been more than 400 years since a tsunami flooded the banks of Lake Lucerne and the city of Lucerne. The risk of tsunamis on Lake Lucerne and other Swiss lakes has not disappeared, this is why researchers from ETH Zurich, the University of Bern and the Center for Marine Environmental Sciences in Bremen began a research project to learn about the hazards posed by lake tsunamis, how often they have occurred in the past, what triggers them and what effects they have. Researchers hope to develop a geophysical and





geotechnical 3D model to study the propagation of seismic waves or deformations caused by earthquakes. They also want to develop computer simulations for earthquake scenarios.

<http://swissinnovation.org/news/web/2018/06-180914-6c>

## Computing Earth's Motions

(ETH Zurich, September 17, 2018)

Marie Bocher develops equations to understand what literally moves the Earth: the geodynamicist is working on improving our understanding of how earthquakes occur. Her research focuses on the interplay between what happens within the Earth and the dynamics we observe at its surface. "The Earth's surface is divided into tectonic plates that are in constant motion of a few centimeters per year. Each plate has its own speed and direction of motion, so the contact between neighboring plates are zones of intense deformation," explains Marie Bocher from ETH Zurich. "At these plate boundaries, the stress generally builds up over time, until the rock yields and in some cases the deformation is rapid enough to release seismic waves." When these waves reach the surface with sufficient energy, we experience them as earthquakes, says Bocher.



<http://swissinnovation.org/news/web/2018/06-180917-91>

## Biodiversity from Above

(University of Zurich, September 18, 2018)

Researchers at the University of Zurich are asking the question about how we can approximate scientifically the global impact of people on biodiversity. Instead of simply counting species, they are investigating the functional diversity of plants, which describes the diversity of interrelationships between ecosystems, species and genes. The researchers are also looking into clearly measurable plant characteristics. By studying these attributes, they are able to draw conclusions about diversity, and also the health of forests. To do this the scientists deploy highly specialized equipment they have developed in collaboration with the European Space Agency and mounted in aircraft. The equipment includes a spectrometer to measure from the air the light from the sun that hits plants and is reflected. On the basis of how the plants reflect different wavelengths of light, the researchers can determine the physiological characteristics of the leaves and the nitrogen, chlorophyll and water content.



<http://swissinnovation.org/news/web/2018/06-180918-eb>

## Turbid Storms Weaken Alpine Lakes

(Eawag, September 18, 2018)

Researchers at the University of Lausanne, Eawag and the French National Agricultural Research Institute investigated a French mountain lake during the course of three summer seasons. Out of ten storms that took place during this period, two turned the lake into a cloudy brew. The remaining storms stirred up the surface waters, but after a week the lakes returned to their normal condition. But during the so-called "turbid storms", large quantities of suspended particles from the glacial catchment area entered the water. The suspended particles are responsible for the fact that hardly any light penetrates to the deep waters. The algae lose the basis for photosynthesis and die. This leads to oxygen and nutrient depletion, which eventually harms fish. It is thus shown that for life in Alpine lakes, long-term global warming is not the only role player; equally important is the frequency of extreme events.



<http://swissinnovation.org/news/web/2018/06-180918-41>

## Effect of Weightlessness on Soil

(Eawag, September 21, 2018)

In the future, astronauts on long missions in space will have to take care of their own farming. Researchers at the Eawag are investigating, how water, gases, and microbiology behave in soils when there is an absence of gravity. They used an airplane and completed 16 parabolic flights with soil analogues — porous plates with tiny glass beads inside them that mimic soil structures. Throughout the duration of the flights, Jimenez and Borer recorded the water and chemical changes in the soil analogues using a special camera. Various instruments also measured temperature, pressure and other parameters. The detailed results of the experiment are scheduled to be published by next summer.

<http://swissinnovation.org/news/web/2018/06-180921-df>



## Silicon Carbide Transformers Achieve 98% Efficiency

(ETH Zurich, September 24, 2018)

ETH Zurich researchers have developed a smart electronic transformer that works extremely efficiently to transform medium-voltage into low-voltage. Smart transformers of this kind are also much smaller than standard transformers. The researchers had to develop many of the components for their transformer themselves, as there are few components available off the shelf for the medium-voltage of 10,000 volts they work with. Components made from silicon carbide that enable extremely fast switching, prototypes manufactured by a U.S. firm, were especially important. Using these, they were able to convert medium-voltage to a very high frequency of 75,000 hertz; as a result, the transformer system they built is just one-third the size of previous smart transformers with similar power ratings. While earlier systems achieved an energy efficiency of around 96%, the researchers managed 98%.

<http://swissinnovation.org/news/web/2018/06-180924-c6>



## Origins of High Plains Landscape

(ETH Zurich, September 26, 2018)

Researchers from ETH Zurich and University of Nevada have been studying the origins of the High Plains in the United States formed 20 million years ago. Recently, a zone of unusually hot material in the Earth's mantle that creates uplift that is slowly shifting from west to east under the continental plate, was discovered. This wave first uplifted the Colorado Plateau, then the Rockies and finally the plains themselves. For 15 million years, a massive flow of sediment poured out of the mountains, filling the river valleys and older topography, effectively 'repaving' the landscape to form the gentle slopes of the modern high plains. The surface of the plains sealed with sand, mud and clay, thus making it possible for rain water to remain in sinks to form lakes. Chemical processes eventually led to a calcification of the lakebeds and soils, forming limestone layers up to 10 meters thick.

<http://swissinnovation.org/news/web/2018/06-180926-c2>



## Protein Prevents Plants from Premature Flowering

(University of Geneva, September 27, 2018)

The induction of flowering is of major importance from an ecological and agronomic point of view. Timely and synchronous flowering is essential to optimize pollination and allow seed production and maturation under favorable environmental conditions. Environmental factors, including light in particular, regulate flowering time, the mechanisms of which have been the subject of many studies. However, these experiments were usually performed in growth chambers in the absence of UV-B, a type of radiation that is a natural component of sunlight and, for example, is responsible for sunburns in humans. A team from the



University of Geneva has discovered that UV-B can be a powerful inducer of flowering, but that a protein called RUP2 blocks their action to prevent early flowering.

<http://swissinnovation.org/news/web/2018/06-180927-4d>

## 7. Engineering / Robotics / Space

### First Discovery of Iron and Titanium in Exoplanet Atmosphere

(University of Bern, August 15, 2018)

For the first time, researchers of the universities of Bern and Geneva have proven the presence of iron and titanium in the atmosphere of an exoplanet. The existence of these elements in gas form was theoretically predicted by a team led by the Bernese astronomer Kevin Heng and has now been confirmed by Geneva-based astronomers.

<http://swissinnovation.org/news/web/2018/07-180815-49>



### Jupiter's Growth Disorders

(University of Zurich, August 27, 2018)

With an equator diameter of around 143,000 kilometers, Jupiter is the largest planet in the solar system and has 300 times the mass of the Earth. The formation mechanism of giant planets like Jupiter has been a hotly debated topic for several decades. Data collected from meteorites had indicated that the growth of the giant planet had been delayed for two million years. Now astrophysicists of the Swiss National Centre of Competence in Research (NCCR) PlanetS of the Universities of Zurich and Bern and ETH Zurich have found an explanation: Collisions with kilometer-sized blocks generated high energy, which meant that in this phase hardly any accretion of gas could take place and the planet could only grow slowly. "We could show that Jupiter grew in different, distinct phases," explains Julia Venturini from University of Zurich.

<http://swissinnovation.org/news/web/2018/07-180827-d9>



### Research Helps Make Buses Smarter

(ETH Zurich, September 03, 2018)

ETH Zurich researchers are helping Swiss bus manufacturer Carrosserie Hess develop software that could provide major cost and energy savings. The company's intelligent city trolleybus has a unique design, featuring a hybrid electric drive system that allows it to draw power from an on-board traction battery as well as overhead wires. Its specially designed software automatically gathers information on the route, so it always knows what to expect and identifies the optimum source of power at each particular moment. The energy management software package can reduce energy use by up to 15 percent, which translates into considerable cost savings. The collaboration between ETH Zurich and Carrosserie Hess has boosted the company's competitive edge and enabled the researchers to translate their theoretical expertise into concrete projects.

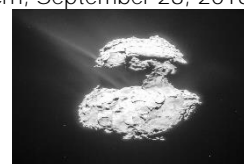
<http://swissinnovation.org/news/web/2018/07-180903-d1>



### Mass Spectrometer Analysis of Comet Chury

(University of Bern, September 28, 2018)

The European Space Agency's Rosetta mission has studied the comet Chury for more than two years. Under the leadership of the University of Bern, the mass spectrometer ROSINA (Rosetta Orbiter Spectrometer for Ion and Neutral Analysis) was developed, built, tested and operated on the comet. ROSINA was able to detect many components of Chury's atmosphere. By means of isotope analysis, researchers at University of Bern





were able to show that the water on the comet Chury differs from the water on earth. There are also signs that the comet ice is older than our solar system, which means that the water has already formed in the cold molecular cloud, from which then our solar system was formed. A surprise was the detection of molecular oxygen, because it is often associated with life on Earth. "But there is no life on the comet," says Kathrin Altwegg.

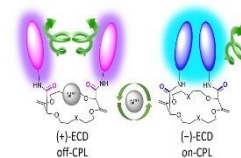
<http://swissinnovation.org/news/web/2018/07-180928-06>

## 8. Physics / Chemistry / Maths

### New Chemical Sensor Detects Metals in the Environment

(University of Geneva, August 15, 2018)

An international team of researchers, led by the University of Geneva (UNIGE), has developed a new type of chemical sensor capable of detecting the presence of metals in the environment. Consisting of a family of molecules that binds to metal ions, the sensor acts like a switch, providing an easily detectable light signal during binding. It forms a 3D structure whose molecules are chiral, i.e. structurally identical but not superimposable – like left and right hands. These molecules consist of a ring and two luminescent arms that emit a particular type of light in a process called Circular Polarized Luminescence (CPL) and selectively detect ions like sodium. The sensor, easily assembled through only two synthetic steps, has numerous practical applications. The findings are published in Chemical Science.

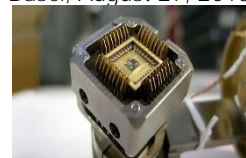


<http://swissinnovation.org/news/web/2018/08-180815-68>

### New Mechanism of Electron Spin Relaxation

(University of Basel, August 27, 2018)

Physicists at the University of Basel are working on using the spin of an electron confined in a semiconductor nanostructure as a unit of information for future quantum computers. For the first time, they have now been able to experimentally demonstrate a mechanism of electron spin relaxation that was predicted 15 years ago. The scientists also succeeded in keeping the direction of the electron spin fixed for almost a minute – a new record.



<http://swissinnovation.org/news/web/2018/08-180827-98>

### Probing Individual Edge States with Unprecedented Precision

(University of Basel, September 12, 2018)

A new technique developed by physicists of the University of Basel in collaboration with University of California, Los Angeles, and Harvard University and Princeton University makes it possible to obtain an individual fingerprint of the current-carrying edge states occurring in novel materials such as topological insulators or 2D materials. The physicists have further developed a technique based on tunneling spectroscopy. They used a gallium arsenide nanowire located at the sample edge which runs in parallel to the edge states under investigation. In this configuration, electrons may jump (tunnel) back and forth between a specific edge state and the nanowire as long as the energies in both systems coincide. Using an additional magnetic field, the scientists control the momentum of tunneling electrons and can address individual edge states. From the measured tunneling currents, the position and evolution of each edge state may be obtained with nanometer precision.



<http://swissinnovation.org/news/web/2018/08-180912-bf>



## Paradox in Quantum Mechanics

(ETH Zurich, September 18, 2018)

Although quantum mechanics describes events at the microscopic level very accurately, it comes up against its limits with larger objects. The theory of relativity in turn is used to describe the behavior of planets, for instance, however can't correctly describe small-scale processes. ETH Zurich physicists conducted a thought experiment, where they considered a hypothetical physicist examining a quantum mechanical object and then used quantum mechanics to calculate what that physicist would observe. According to our current worldview, this indirect observation should yield the same result as direct observation, yet the authors' calculations show that the physicist will observe exactly the opposite of what would be measured directly. This paradoxical result is polarizing experts.

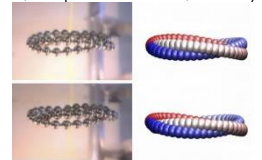


<http://swissinnovation.org/news/web/2018/08-180918-19>

## Knotted Molecular Chains Fall Flat

(EPFL, September 20, 2018)

Long-chain molecules, like DNA, can develop knots, and these knots in turn affect how the molecules move through a liquid. To understand this behavior, researchers from the Laboratory of Physics of Living Matter, in collaboration with colleagues in Warsaw and at the University of Lausanne, devised an experiment with loops of small metal beads, mimicking knotted molecular chains, dropped in a viscous fluid. Surprisingly, all the loops settled into horizontally flat configurations as they fell - no matter how they were initially dropped. The results show a connection between topology and hydrodynamics that may help researchers understand the shape evolution of large molecules moving in fluids.



<http://swissinnovation.org/news/web/2018/08-180920-b5>

## 9. Architecture / Design

### Perfect Shade with Computer Designed and Assembled Pergola

(ETH Zurich, August 08, 2018)

Designed on a computer and built with the help of robots: ETH Zurich students studying for the MAS in Architecture and Digital Fabrication have built a wooden pergola to turn the sun-baked terrace at the Istituto Svizzero in Rome into a pleasant, shady spot. Their project demonstrates the potential that digital fabrication holds for wooden buildings. What is striking about the almost four-meter-tall construction is how its short wooden elements are joined with nothing more than wooden dowels. Depending on the position of the sun, the system of wooden elements expands and thickens so as always to provide shade. "If you look more closely at the pergola's structure, you will discern a set of rules that hint at the digital origin of the design. Each wooden element is part of a greater system.



<http://swissinnovation.org/news/web/2018/09-180808-3e>

### Solar-Powered Pilot Unit in Dübendorf

(EPFL, September 24, 2018)

SolAce, which recently opened its doors at the NEST building in Dübendorf, is a pilot unit where researchers will test new technology for sustainable living and optimal user comfort. The building will generate more power than it uses (for heating and electricity) and will be carbon neutral or even carbon negative. Intended to be a combined working-living space, it has a bedroom with two separate beds, a kitchen and a living room. "By reducing the amount of commuter traffic from people going to and from work, we can make a substantial cut



in carbon emissions. Two researchers will live and work at SolAce for two years to try out our idea of a dual-purpose building,” says Jean-Louis Scartezzini from EPFL and SolAce project leader.

<http://swissinnovation.org/news/web/2018/09-180924-3e>

## 10. Economy, Social Sciences & Humanities

### Distinguishing Followers from Leaders

(University of Zurich, August 03, 2018)

Researchers at University of Zurich investigated what it is that sets people with high leadership abilities apart. They identified and characterized a common decision process that may distinguish followers from leaders: Responsibility aversion, or the unwillingness to make decisions that also affect others. The scientists tested several common intuitive beliefs, such as the notion that individuals who are less afraid of potential losses or taking risks, or who like being in control, will be more willing to take on responsibility for others. These characteristics, however, did not explain the differing extent of responsibility aversion in the participants. Instead they found that responsibility aversion was driven by a greater need for certainty about the best course of action when the decision also had an effect on others. This shift in the need for certainty was particularly pronounced in people with a strong aversion to responsibility.

<http://swissinnovation.org/news/web/2018/10-180803-55>

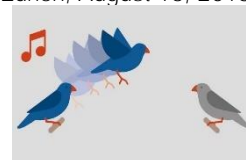


### How Birds Learn

(University of Zurich, August 13, 2018)

Children are constantly learning new things, but whether they find it easy or hard to generalize what they have learned and apply it to new situations can depend on how they learned it. It is much the same for songbirds. In their first few months of life, they too must learn a great deal; for example, the characteristic song of their species. And like people, birds also learn in different ways. Researchers at ETH Zurich and University of Zurich found that songbirds (zebra finches) can acquire new abilities both through observation and through trial and error. However, skills acquired with the latter method are more easily adapted to new situations.

<http://swissinnovation.org/news/web/2018/10-180813-f1>



### Scent of Women with High Fertility Is More Appealing to Men

(University of Bern, September 12, 2018)

It is not just the visual impression that plays an important part when choosing a partner but also their scent. Previous studies have shown that how attractive a woman smells changes across the menstrual cycle: a woman smells most attractive to men during the most fertile days. A team of researchers at the University of Bern working together with colleagues from the University of Constance, the Thurgauer Institute of Economics and University Hospital and Inselspital Bern have now also been able to show that the scent of certain women is universally more appealing to men than others, and it depends on their hormone levels: "Women with high oestrogen and low progesterone levels are most attractive to men in an olfactory sense," according to Daria Knoch. This undoubtedly makes sense from an evolutionary perspective; these hormone levels indicate high female fertility.

<http://swissinnovation.org/news/web/2018/10-180912-30>





## Debit Card Beats Cash

(Zurich University of Applied Sciences, September 14, 2018)

The most popular means of payment in Switzerland is now the debit card (Maestro, PostFinance, or V PAY). It is considered user-friendly, practical, and trustworthy, and therefore preferable to all other payment methods. While cash continues to be the option of choice in stationary rather than online trade when measured by the number of transactions, it is the debit card, with its 37% share of overall expenditure, which wins out in terms of sales, according to a large-scale research study conducted jointly by the University of St. Gallen and Zurich University of Applied Sciences. The study aims to map the Swiss payment landscape and highlight future market developments. Whereas consumer payment behavior was relatively stable for a long time, a change is now gradually emerging.

<http://swissinnovation.org/news/web/2018/10-180914-2d>



## Banks Do too Little to Communicate Their Sustainable Investment Products

(University of Zurich, September 19, 2018)

Researchers of the University of Zurich analyzed the sustainable offerings aimed at wealthy clients of 15 European banks. Their analysis focused on the banks' mission statements, their range of offers as well as associated services. Globalance Bank from Switzerland and Triodos Bank from the Netherlands, both of which specialize in sustainability, achieved the best marks. Other banks, including UBS and Credit Suisse, roughly correspond to the industry average, with individual strengths and weaknesses. However, the banks' products fall short where there might be the largest interest and impact for investors. "Many banks buy shares and funds for their clients and hope for the price to go up and integrate sustainability aspects into the relevant products. But very few actively engage with their investees and achieve meaningful impact", says Falko Paetzold.

<http://swissinnovation.org/news/web/2018/10-180919-77>



## Employment Bans Are Counterproductive

(ETH Zurich, September 19, 2018)

In many European countries, asylum seekers face temporary employment bans that keep them out of the labor market. There is now evidence that this practice is counterproductive over the long term: a study by the Immigration Policy Lab of ETH Zurich and Stanford University shows that refugees in Germany who had shorter employment bans were able to find work much faster than those who had longer bans. Five years after the waiting period ended, the employment rate is 20 percentage points higher among refugees subjected to a shorter employment ban. This impedes integration. "Policies such as employment bans are short-sighted", says Moritz Marbach. "Instead of having refugees dependent on government welfare for years, countries like Germany can capitalize on their initial motivation and integrate them quickly."

<http://swissinnovation.org/news/web/2018/10-180919-63>



## The Soothing Effects of Strangers

(University of Zurich, September 26, 2018)

Social factors play a crucial role in determining how people experience pain. Researchers from the Universities of Zurich, Würzburg and Amsterdam have investigated how a key social factor, group membership, affects pain experience. The participants received pain in the form of electric shocks to the back of their hand, which they were asked to rate in terms of intensity. One group was given pain relief by persons with the same nationality as the participants, the other group was treated by persons with a different nationality. The study shows that people experience significantly stronger pain relief if they are treated by a person who belongs to a different social group, compared to getting help from a member of the same group. This effect



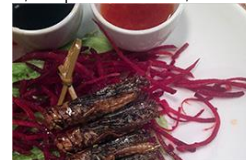
was not limited to the subjective pain experience, but there was also a reduction of the pain-related activation in the corresponding brain regions.

<http://swissinnovation.org/news/web/2018/10-180926-7a>

## Price Determines Taste of Insects

(University of Bern, September 27, 2018)

For many people in Switzerland and beyond, the idea of eating insects is not particularly attractive. However, insect-based foods have significant environmental and health benefits. Researchers at the University of Bern examined in a series of consumer psychology experiments whether prices are suitable for positively influencing expectations. "Our research shows that high-priced insect products are not only rated better, but that these evaluations are also applied to other insect products for which no price information is available," explains Sebastian Berger from University of Bern. Prices have such a strong impact that even "artificial" price reductions, such as subsidies, have a negative impact on the expected product quality. "High-priced products could therefore help to change consumers' attitudes towards eating insects and to achieve more sustainable food production and a healthier diet, even if this may press demand in the short term," Berger continues.



<http://swissinnovation.org/news/web/2018/10-180927-d6>

## 11. Startups / Technology Transfer / IPR / Patents

### Heatable Lunchboxes

(startupticker.ch, September 10, 2018)

After several years of development and extensive market testing of over 200 HeatsBoxes, the final version of the HeatsBox developed by the startup Faltiron can now be ordered online in Switzerland, Germany and Austria through their website. The Heatsbox works both on the normal power grid and, for example, also in a car. The target temperature can be set as well as the time of heating. In addition, different heating modes can be selected. The control is done by pressing a button or via app. The box is intended for various customer groups such as office workers, pupils and students, truck drivers etc. The startup already has more ideas for expansion. The technical innovations make the step into further market segments possible, for example an IoT integration of the HeatsBox into existing Smart Kitchen platforms.



<http://swissinnovation.org/news/web/2018/11-180910-bd>

### Therapeutics Startup Secures USD 9.7M in Seed Funding

(startupticker.ch, September 12, 2018)

CorFlow Therapeutics announced that the company has completed the second close of its Seed+ financing round, raising additional CHF4.4million. To date and since the foundation in 2016, the company has raised a total of USD 9.7M (CHF 9.4M) in seed funding. The seed rounds have been funded by experienced private medical device investors. The milestones to be reached over the coming months will be the basis for raising the A round in 2019 securing the long-term R&D, clinical and regulatory activities of the company. The seed proceeds will finance the First-in-Man clinical trial in Europe. This "MOCA I" trial is a safety and feasibility study of the newly developed CorFlow Controlled Flow Infusion (CoFI) system which will be studied in 40 acute heart attack patients. CorFlow CoFI system aims for an early detection and treatment for damages in the heart tissue.



<http://swissinnovation.org/news/web/2018/11-180912-c9>

## Mini Version of World's Safest Drone

(startupticker.ch, September 19, 2018)

Aerotain revolutionized the drone industry with their entertainment drones. Since 2016, the Zurich based Aerotain has been dedicated to creating memorable experiences for people at different events while enabling event organizers to engage with their customers, thanks to their aero drone, Skye. With more than a 70% revenue growth, the company has now expanded its product line with the Aerotain Mini to serve small-size events. Aerotain Mini is four times smaller than the previous system allowing it to fit perfectly in smaller spaces as well as in rooms with a lower ceiling. Due to its size, event organizer can now install multiple drones at an event. Aerotain Mini has already been in use at an event recently, and there is a high demand for it.



<http://swissinnovation.org/news/web/2018/11-180919-0a>

## Emergency Call Watch

(startupticker.ch, September 26, 2018)

In 2017, Smartwatcher Technologies entered the market with their emergency call watches to enable people to trigger an alarm by only one press of a button. Today, SmartWatcher watches are available in more than 80 shops. The Zurich based startup is dedicated to making safety available for anyone with an increased risk of accident, medical emergency, or attack/harassment. The startup developed a series of emergency call watches with built-in cellular connectivity to enable people to get in contact with their relatives, friends or a professional emergency call-center in case of an emergency.

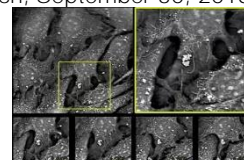


<http://swissinnovation.org/news/web/2018/11-180926-1b>

## Cellular Metabolism Research with Label-Free 3D Live Cell Imaging

(nanolive.ch, September 30, 2018)

Mitochondria are one of the most (if not the most) important cell organelles. They are organized in extremely dynamic networks and, in addition to supplying the cell with energy, they have an important role in apoptosis, metabolism, and degenerative diseases. Until now it was believed that, unless specifically stained, they were not visible in microscopy. By using an entirely new label-free technique called holotomographic microscopy (HTM), a team from the Global Health Institute at Ecole Polytechnique Fédérale de Lausanne (EPFL) in a collaboration with the company Nanolive SA, demonstrated that it is possible to image mitochondria label-free, over long periods of time. Thanks to the extremely powerful time resolution of this technology (one 3D image every 2 seconds) dynamic processes such as mitochondrial fission or fusion, apoptosis and mitochondrial network remodeling could be monitored.



<http://swissinnovation.org/news/web/2018/11-180930-b2>

## 12. General Interest

### Investment in Innovation

(Ernst & Young, August 31, 2018)

According to the latest EY-Switzerland's report, 11 Swiss companies count amongst the 500 most active ones in R&D; with Sweden, Switzerland shares thus the 9th place in terms of number of companies. It is not surprising to note that American companies represent a very large proportion: 25% or 127 out of 500 firms. However (and despite a 1% drop in absolute investments) with €23 billion invested in R&D, Switzerland ranks very well and takes the 4th place of this international ranking. Among global companies heavily investing in R&D, only the Swiss firm "Roche" ranks among the top 10 - with €10.2 million invested in R&D in 2017. And without surprise: Roche, Novartis, Nestlé and ABB lead the Swiss ranking.

<http://swissinnovation.org/news/web/2018/12-180831-07>



## Launch of National Research Programme on Digital Change

(admin.ch, September 21, 2018)

The Federal Council launched a new National Research Programme (NRP) into Digital Change. The main aim of this programme is to increase our understanding of the opportunities and risks of digitalization for society and the economy. The programme will run for five years and has a budget of CHF 30 million. It forms part of the Action Plan on Digitalization in Education, Research and Innovation for the years 2019 to 2020. The NRP has three aligned research modules: The 'Education, Learning and Digital Change module' looks at the impacts of digitalization on education, at life-long processes and at the institutions pertinent to education. Central to the module 'Ethics, Reliability and Governance' are the ethical, organizational, legal and technical challenges involved in ensuring and building trust in digital infrastructure and digital services. The module 'Digital Economy and the Labour Market' addresses the key interactions and effects of digital change on the economy.

<http://swissinnovation.org/news/web/2018/12-180921-c2>

## 13. Calls for Grants/Awards

### Call: Founding for Engineering and Environmental Sciences, and Medieval Disciplines

(zenokarlschindler-foundation.ch, September 30, 2018)

The purpose of the Zeno Karl Schindler Foundation is the encouragement, development and support of top research in the fields of engineering and environmental sciences as well as in the field of all medieval disciplines (languages and literature, philology, history, history of art, musicology, philosophy, theology, "Medieval Studies"). The latest addition is Digital Humanities, resulting of projects in both domains. The ZKS-Foundation realizes its aim principally by subsidizing research projects, by granting subsidies and scholarships to researchers and academics of any nationality that devote themselves to fore-mentioned fields of research. The Foundation also proceeds by granting prizes or other rewards for new and important research work in both domains. The ZKS-Foundation can also donate to universities of all countries for their needs in research equipment as well as support conferences and other scientific meetings. Deadlines to apply for founding are of each year on March 15 and on September 15 at midnight (Swiss time).



<http://swissinnovation.org/news/web/2018/13-180930-34>



## Upcoming Science and Technology Related Events

### Rock Print Pavillion

October 4-November 4, 2018

<https://is.gd/277cUN>

Exhibition, Digital and Robotic Manufacturing  
Winterthur

### Digital Day 2018

October 25, 2018

<https://www.digitaltag.swiss>

Data, Work 4.0, Mobility, Education, Health  
12 Cities in Switzerland

### Swiss Symposium in Point-of-Care Diagnostics

October 18, 2018

<http://www.pocdx.ch/>

Clinical Needs, Personalized Medicine  
Chur

### Ressourcen Forum Schweiz

October 25, 2018

<https://www.wrforum.org/rf-ch-2018/>

Resource Efficiency, Role of Cities  
Dübendorf

### 1<sup>st</sup> International FinTech, InsurTech & Blockchain Forum

October 24, 2018

<https://www.fintech-forum.org/>

Digitalization of Financial Services  
Zurich

### Big Data in den Sozialwissenschaften

November 9, 2018

<https://is.gd/DsBTfE>

Application, Methodology, Implications  
Bern

### CEIBS Insights 2018 | The 4<sup>th</sup> Europe Forum

October 24, 2018

<https://is.gd/iaR7tB>

Smart Healthcare  
Zurich

### Swiss Inter- and Transdisciplinary Day 2018

November 15, 2018

<https://is.gd/TlrnI3>

Digitalization, Education, Research  
Lausanne

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 China](https://www.swissnex.ch/) in collaboration with the [swissnex Network](https://www.swissnex.ch/).

**Science-Switzerland Back Numbers:** [www.swissinnovation.org/Science-Switzerland](http://www.swissinnovation.org/Science-Switzerland)

#### Disclaimer

The information in this newsletter is an opinion excerpt of news material from Switzerland and gathered to the best knowledge of the writer. The newsletter tries to provide information without any news preferences, and takes no claims, promises or guarantees about the accuracy, completeness, or adequacy of the information. No legal liability or responsibility can be taken. The information is provided for informational purposes only. No part of the newsletter may be used for any commercial or public use. Open disclosure of this newsletter is not permitted.