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Science-Switzerland, August-September 2019

News on Swiss science, technology, education and innovation

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Two Swiss Scientists Win Nobel Prize in Physics

(University of Geneva, September 30, 2019)

In early October, two Swiss scientists were awarded the Nobel prize in Physics for their discovery of the first exoplanet. The two Swiss scientists jointly received one half of the price, with the other half going to a Canadian researcher - John Peebles - for his theoretical discoveries in physical cosmology. On October 6, 1995, Michel Mayor, Professor at the Observatory of the Faculty of Science of the University of Geneva, Switzerland, and his doctoral student Didier Queloz revolutionized the world of astrophysics when they announced the discovery of the first planet located outside our solar system. Named 51 Pegasi b, this very first exoplanet had a huge impact on the astrophysicist community. Since that day, roughly 4000 exoplanets have been discovered. Both, Michel Mayor and Didier Queloz were awarded the Nobel prize in Physics.
http://swissinnovation.org/news/web/2019/00-190930-a9

EPFL's Professor Michael Grätzel is Top #1 Scientist

(EPFL, August 26, 2019)

A study conducted by Stanford University, places EPFL Professor Michael Graetzel on the first place on a list of 100,000 scientists. Professor Grätzel directs the Laboratory of Photonics and Interfaces and is best known for inventing the dye-sensitized solar cells, so-called “Grätzel cells”, which contributed hugely to the current development of perovskite photovoltaics. The ranking developed by Stanford University used a novel method which considers citations as well as other metrics. Unlike previous ranking methods, the new approach does not fall prey to common citation manipulations such as self-citation or “citation farms” – groups of scientists which disproportionately often cite each other. So far, the database includes over 100,000 scientists across various fields.
http://swissinnovation.org/news/web/2019/00-190826-8e

Record Number of ERC Starting Grants for ETH Zurich

(ETH Zurich, September 03, 2019)

Scientists from ETH Zurich were once again hugely successful in the latest round of the prestigious ERC Starting Grants. So successful that they achieved a new record for ETH. Three women and 12 men each received an average of 1.5 million euros for their research projects. In total, ETH Zurich will receive 23 million euros. The selected projects cover a range of disciplines, from astronomy and mathematics to climate modelling. The researchers work in a total of nine different ETH departments. 39 researchers submitted applications fand fifteen of these were approved, which equates to a success rate of 38.5%. Last year, the success rate was at 20%. An official at ETH Zurich mentioned how important the Grants are because they enable researchers to conduct ambitious projects. The high number of the ERC Starting Grants demonstrates the institutions enormous potential.
http://swissinnovation.org/news/web/2019/00-190903-50

1. Policy

Workplace Diversity Versus Workplace Homogeneity

(University of Basel, August 12, 2019)

Although, many large companies underline the importance of diversity at the workplace, the reality often looks different - and less diverse. People tend to prefer team members who are similar to themselves. There is a strong disparity between what colleagues people select for themselves versus for other people. On one hand, people from a different background contribute new perspectives, ideas or innovative solutions. On the other hand, it might be difficult to work with someone who differs very strongly in their views or speaks another language. Building on current theories, the researchers have shown that doubts about the practicability of diversity have a greater weight if a person is directly affected. This leads to the conclusion that organizations could become more diverse if hiring and team decisions were not only made by those directly affected, but also by other people who are indirectly involved.
http://swissinnovation.org/news/web/2019/01-190812-4c

Innosuisse Funds "Manufacturing Technologies" Projects

(The Federal Council, September 03, 2019)

Innosuisse has recently approved 17 innovative projects out of 29 applications and granted funding amounts north of USD 6 million. The projects cover a broad array of modern manufacturing technologies and the industry 4.0. One project focuses for instance on the use of digital copies of manufacturing processes, so-called “digital twins”. Another one use artificial intelligence to predict the quality of high-end wood products. Innosuisse - the Innovation Council of Switzerland - carefully evaluated all project applications and approved the best 17. A total of CHF 24 million is available for the “Manufacturing technologies” impulse programme that Innosuisse is implementing as part of the Federal Council’s 2019–2020 action plan to promote digitalisation.
http://swissinnovation.org/news/web/2019/01-190903-4c

2. Education

Easier University Access for Top Athletes

(University of Zurich, September 09, 2019)

Professional athletes are welcome students for many universities as they often excel academically due to their high levels of discipline. The University of Zurich is now taking measures to facilitate doing a degree next to doing sports on a professional level. For instance, the faculties were asked to make some adjustments such as an extension to the standard period of study or alternative dates for exams in case the students are proven top athletes. In order to help young athletes make a decision on whether to study and assist them in the planning, University of Zurich organized an information event where three former top athletes were ready to answer questions. As of now, there are 80 top athletes at the University of Zurich, however, it is hoped that there will be more in the future.
http://swissinnovation.org/news/web/2019/02-190909-a9

Time Higher Education Summit: Reskilling of Workforce and Education

(ETH Zurich, September 13, 2019)

ETH Zurich recently hosted the Times Higher Education World Academic Summit, during which experts from research and higher education met and discussed topics such as the future of employment and how to define and nurture talent. There was broad agreement that the imminent digitization will bring about a change in the skill set which industry requires from young talent as more and more processes will be automated. This development will sweep the education landscape drastically and require a profound rethinking and reskilling. However, to the question which skills employees will need for jobs in the future, no conclusive answer was given. Among others, analytical and innovative thinking, active learning, creativity or originality were mentioned as skills gaining importance. Furthermore, the importance of collaborations between industry and universities were addressed.
http://swissinnovation.org/news/web/2019/02-190913-f9

3. Life Science

Gene Identified as Link to Autism and Schizophrenia

(University of Lausanne, August 01, 2019)

A research team at the Department of Fundamental Neurosciences at UNIL – collaborating with researchers at the Universities of Antwerp and Leuven (Belgium) and Rome Tor Vergata (Italy) – have shown that an alteration of the CYFIP1 gene in mice disrupts connections between neurons and induces behaviors typical of autism or schizophrenia – e.g., a lack of sensory perception and motor disorders. The study, published in Nature Communications, shows that the presence of a single copy of the CYFIP1 gene leads to a decrease in neural connections between the two brain hemispheres, resulting in reduced balance and coordination of movements. The team will investigate whether motor skills training and movement therapy can improve mouse brain activity and behavior, and potentially be used to treat these developmental disorders.
http://swissinnovation.org/news/web/2019/03-190801-6e

Using Single Cell Technology to Identify Biomarkers

(ETH Zurich, August 05, 2019)

The search for biomarkers is currently one of the biggest challenges of modern medicine. One of the goals is for patients to be able to take a blood test and check whether they may have a disease, before the first symptoms make themselves known. If this were possible, patients could receive targeted treatment and could in many cases be cured. In its quest to discover these biomarkers, the ETH spin-off Scailyte has developed a software capable of analysing millions of single cells very efficiently. Their aim, over the coming years, is to standardise the software and offer it for clinical applications. At the moment they are working together with the University Hospital of Zurich and the University Hospital in Bern.
http://swissinnovation.org/news/web/2019/03-190805-f2

The Zurich Heart Project

(Empa, August 06, 2019)

For many patients with heart failure, an artificial heart pump is a lifesaver, but it often causes side effects. There is a risk of blood clots or a rejection of the foreign material. Researchers at Zurich University Hospital, together with colleagues from the University of Zurich and ETH Zurich, therefore launched the "Zurich Heart" project in 2011. Several Empa teams are also part of Zurich Heart and are working on a new generation of heart pumps that will be camouflaged in such a way that human immune cells cannot distinguish them from a real heart. Zurich Heart is now entering its second phase, where scientists want to translate some of the solutions developed within Zurich Heart into clinically relevant products.
http://swissinnovation.org/news/web/2019/03-190806-1d

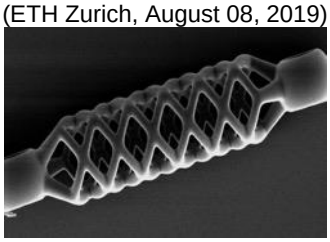
Biodegradable Microresonators for Missions Inside the Human Body

(EPFL, August 07, 2019)

Researchers from the EPFL have developed biodegradable microresonators that can be heated locally with a wireless system. Doctors could soon be using them in implants to control the release of painkillers within tissue. This implant that would release a local anesthetic on-demand over several days. Not only would this implant reduce patients' post-op discomfort, but there would be no need for further surgery to remove it. They developed a tiny biodegradable electronic circuit, made from magnesium, that could be heated wirelessly from outside the body. Once integrated into the final device, the circuit will allow to release controlled amounts of anesthetic in a specific location over several days. After that, the implant will degrade safely inside the body.
http://swissinnovation.org/news/web/2019/03-190807-69

Smallest Shape-Memory Stent to Save Foetuses in the Womb

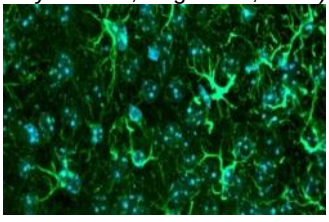
(ETH Zurich, August 08, 2019)



One in every thousand children develops a urethral stricture, which can cause an accumulation of urine in the bladder and in the worst case lead to death. Such a constriction can develop already in foetuses in the womb. The usual approach is to surgically remove the affected area of the urethra and sew the open ends back together, however, inserting a stent would be much less invasive and damaging to the kidneys. So far, it was not possible to produce such small stents as standard methods cannot produce the required micro-size.
At ETH Zurich, researchers have developed a new method to produce micro stents, which are 40 times smaller than previously possible using indirect 4D printing. The fourth dimension is the shape memory property, allowing the stent to restore its original shape even after deformation. Such stents could in the future be used to widen life-threatening constrictions in the urinary tract of foetuses in the womb.
http://swissinnovation.org/news/web/2019/03-190808-a1

How Brain Tumors Promote their Own Growth

(University of Bern, August 13, 2019)



Cancer cells are characterized by uncontrolled growth and cell division. A glioblastoma is a particularly aggressive form of brain tumor, which results from uncontrolled growth of so-called glial cells. Glial cells surround and provide support for neurons, playing a major role in supplying energy and transmitting information. Researchers from the University of Basel and the University Hospital Basel have analyzed the proteome – the complete set of proteins – of various glioblastomas and uncovered how cancer cells in brain tumors promote their own growth. They do this by inhibiting growth receptor degradation in the brain's cells and intensifying

receptor signal transmission. The study findings, published in EBioMedicine, contribute to the understanding of the molecular processes of cancer growth and could provide new avenues for treatment approaches.
http://swissinnovation.org/news/web/2019/03-190813-3a

Biological Clocks are Locked in Sync

(EPFL, August 13, 2019)

Scientists from EPFL's Institute of Bioengineering have discovered that our circadian clock – which regulates our sleep/awake rhythm – and our cell cycle – which regulates the growth, life and death of virtually every cell in our body – are synchronized. Nothing in biology is static; everything is fluid, dynamic and ever-moving, often in repeating patterns or regular, measurable cycles that tick just like "clocks". Naturally, the circadian clock follows a daily rhythm. The cell cycle in many systems has been found to involve a similar time scale. There is even some evidence suggesting that both clocks might actually influence each other. The breakthrough study, published in Nature Physics, found that circadian-cell cycle synchronization is common across different species, including humans, suggesting a fundamental biological mechanism behind it.
http://swissinnovation.org/news/web/2019/03-190813-8a

Technique to Track Efficiency of Stargardt Disease Treatment

(University of Basel, August 13, 2019)

Stargardt disease is a hereditary eye disease that leads to visual defects and the loss of sight and has to date remaine untreatable. It is the most common form of juvenile macular degeneration that affects the center of the retina and leads to progressive loss of eye sight. A study which was conducted under the involvement of the University of Basel has shown that autofluorescence imaging might offer a way to assess whether novel treatments are effective at slowing down vision loss. The research group could show that measurements of macular lesions imaged by autofluorescence enable a reliable prediction of disease progression. Therefore, this technique is a promising outcome measure in clinical trials that aim at slowing down the disease and, in the end, loss of vision.
http://swissinnovation.org/news/web/2019/03-190813-28

Structural Biology is Revolutionizing Drug Development

(University of Zurich, August 14, 2019)

The human body functions through the interaction of countless proteins, which catalyze chemical reactions, convey information from one cell to another and ensure a well-functioning immune system - among other things. Proteins are able to do all that thanks to their 3-dimensional structure and observing precisely this structure is crucial for disease research and drug development. That's where structural biology comes into play. Nowadays, structural biologists helps to virtually develop all drugs by using technologies such as the diffraction of X-rays. A disadvantage of this technology is that the proteins need to be brought into a crystal structure first, which is difficult. It often takes years to discover how to produce crystals from a particular protein. This is slowly changing, thanks to developments in protein engineering. One method is cryo-electron microscopy which has the advantage that no crystal is needed but merely a stable protein in a solution. Recent technical developments have led to huge improvements in this method and it is going to revolutionize structural biology.
http://swissinnovation.org/news/web/2019/03-190814-21

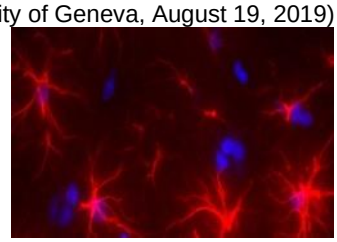
Revolutionary Modified CRISPR Method

(ETH Zurich, August 14, 2019)

CRISPR-Cas is a biotechnological method that offers a relatively quick and easy way to manipulate single genes in cells, meaning they can be precisely deleted, replaced or modified. Researchers at ETH Zurich have refined the famous CRISPR-Cas method and use biotechnology to influence entire gene networks in a single step. Now, for the very first time, it is possible to modify dozens, if not hundreds, of genes in a cell simultaneously. The method can be used to increase the activity of certain genes, while reducing that of others. The timing of this change in activity can also be precisely controlled. This is of interest for basic research, for example in investigating why various types of cells behave differently or for the study of complex genetic disorders. It will also prove useful for cell replacement therapy, which involves replacing damaged with healthy cells.
http://swissinnovation.org/news/web/2019/03-190814-29

Liver Disease Impacts Brain Earlier than Expected

(University of Geneva, August 19, 2019)



The liver plays a vital role as a filter in the human body. When the liver is diseased, as is the case with cirrhosis, a number of substances are no longer filtered, which can cause psychological, motor and neurocognitive disorders in adults. Researchers from Universities of Geneva and Lausanne, EPFL, Centre for Biomedical Imaging and University Hospitals of Vaud and Geneva have conducted research into how liver diseases affect the human body. The scientists were able to observe for the first time in a mouse model that a dysfunction of the liver provokes cerebral molecular disturbances in two weeks, even though no physical symptoms are apparent. The results suggest that an MRS brain scan might detect the neurological manifestations of chronic liver disease long before the appearance of the first symptoms. It is being analyzed whether it is possible to protect the brain from this type of deterioration by compensating for the lack of creatine and vitamin C.
http://swissinnovation.org/news/web/2019/03-190819-1c

Essential Proteins for Cell Division

(ETH Zurich, August 19, 2019)

Although meiosis and mitosis are crucial for our health, very little was known till now about how the whole system functions and is regulated. Scientists already knew that yeast, along with plants, animals and humans, have a group of seven enzymes involved in the reproduction of DNA: the recombination intermediates processing enzymes (RIPEs). A research group at ETH has been able to identify which RIPEs are important for which phase of cell division and which helper proteins interact with the RIPEs in each case. The results from the yeast cells can be transferred to humans, as for every helper protein involved there is an equivalent in humans that functions in the same or very similar way.
http://swissinnovation.org/news/web/2019/03-190819-6a

Optic Nerve Stimulation

(EPFL, August 19, 2019)

Blindness affects an estimated 39 million people in the world. Many factors can induce blindness, like genetics, retinal detachment, trauma, stroke in the visual cortex or infection. Some blindness is temporary and can be treated medically but how to help someone who is permanently blind? A research team where scientists of EPFL are involved has developed a technology for the blind that bypasses the eyeball entirely and sends messages to the brain. This is dones

by stimulating the optic nerve with a new type of intraneural electrode called OpticSELINE. This could be a valuable solution for several neuroprosthetic devices for sensory and motor function restoration. The technology was already successfully tested in rabbits, but will take feedback from patients in order to fine-tune the technology. With current electrode technology, a human OpticSELINE could consist of up to 48-60 electrodes. This limited number of electrodes is not sufficient to restore sight entirely but it could be engineered to provide a visual aid for daily living.
http://swissinnovation.org/news/web/2019/03-190819-15

Producing Skin Tissue for Burn Patients

(csem, August 19, 2019)

Every year, 50 million people suffer large skin defects, such as burn injuries. Often, they are treated with autografting, a skin grafting method older than modern medicine, which often leaves the patients with disfiguring and debilitating scars. Zurich-based Cutiss AG, a spinoff of the University of Zurich, wants to offer an alternative by bio-engineering a personalized, permanent skin graft that will minimally scar after transplantation. The company has developed denovoSkin™, which is now being tested in a phase II clinical trial. In collaboration with the Swiss research and technology organization CSEM, the project will develop an innovative approach for automating the skin engineering process while preserving the quality of the tissue. The end result envisaged by Cutiss is a skin-tissue producing machine that would require minimal user interaction. A challenge will be to produce skin tissues on a comercially relevant scale.
http://swissinnovation.org/news/web/2019/04-190819-a3

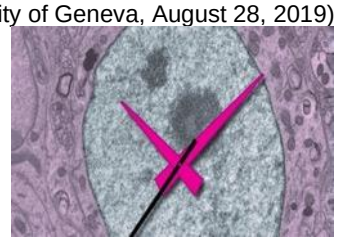
3D-printed Salt Template for Bioresorbable Bone Implants

(ETH Zurich, August 26, 2019)

To treat complex bone fractures or missing bone parts, surgeons typically deploy metal implants. Biodegradable magnesium and its alloys offer an attractive alternative to traditional materials like bioinert titanium. Implants made of this light metal are advantageous because they biodegrade in the body, which can absorb magnesium, thus avoiding the need for additional surgery to remove implants. To encourage rapid healing, the design of implants or their surfaces should promote cellular adhesion or even in-growth. Researchers from the Laboratory of Metal Physics and Technology and the Complex Materials Group at ETH Zurich have jointly developed a new procedure for manufacturing magnesium scaffolds using a 3D-printed salt template. Mechanically stable, these scaffolds have structured porosity making them suitable for bioresorbable bone implants. These findings will be published in Advanced Materials.
http://swissinnovation.org/news/web/2019/03-190826-32

Rejuvenating Brain Cells in the Lab

(University of Geneva, August 28, 2019)



Neurons are generated by progenitor cells, which produce them one after the other in a very precise order. While neuroscience textbooks establish the irreversible nature of this specialization process, researchers at the University of Geneva now provide proof to the contrary. Indeed, when progenitor cells are transplanted into a young mouse embryo, they recover their past skills and rejuvenate. These results are now published in the journal Nature. By revealing an unsuspected progenitor plasticity, they shed new light on how the brain constructs itself. In the long term, they open up new perspectives for the regeneration of damaged cortical circuits.
http://swissinnovation.org/news/web/2019/03-190828-e3

Treating AIDS Patients Suffering From Tuberculosis

(University of Zurich, August 28, 2019)

In both Uganda and Switzerland, AIDS patients suffering from tuberculosis are normally treated with four drugs. These drugs are very effective, inexpensive and well-tolerated. However, if AIDS patients are infected with tuberculosis bacteria that are resistant to one or more drugs, other antibiotics have to be administered. In Uganda, these are mainly aminoglycosides. However, if these are administered in too high a concentration, they can cause hearing loss or kidney damage. In order to precisely measure the concentration of aminoglycosides in the blood, high-performance liquid chromatography coupled to mass spectrometry (LC-MS) is needed. Thanks to the cooperation between the University of Zurich and the Infectious Diseases Institute (IDI) in Kampala, Uganda, IDI has received an LC-MS for research purposes.
http://swissinnovation.org/news/web/2019/04-190828-1b

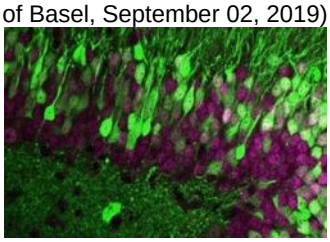
EPFL's Biosensor Wins Second Place

(EPFL, August 29, 2019)

Eindhoven University of Technology in the Netherlands has for the fourth time held the annual SensUs competition. Students were given the task to develop a biosensor to quickly measure the concentration of the antibody adalimumab in a patient's blood plasma. Adalimumab is the main active ingredient of the drug Humira, one of the best-selling drugs in the world, mainly used as an injectable solution for treating rheumatoid arthritis. However, too high concentration of it in patient's blood can cause highly undesirable side effects. The team of EPFL developed a portable biosensor which can rapidly measure adalimumab concentrations and with their project, the team achieved second place. The biosensor uses an optical method that is based on a process of using light to excite free electrons in a metal. On the market, the device would sell for around 7500$US.
http://swissinnovation.org/news/web/2019/03-190829-14

Nerve Cells' Unique Fingerprint Determines Brain Function

(University of Basel, September 02, 2019)



Our brain consists of hundreds, if not thousands, of different types of nerve cells that control our brain functions due to their individual characteristics. In a genome-wide analysis, researchers at the University of Basel's Biozentrum have discovered that a broad range of protein variations, resulting from the process of alternative splicing, control the identity and function of nerve cells in the brain. There are unique repertoires of variants in each nerve cell type, resembling a fingerprint. This process enables organisms to build a highly complex neuronal network with only a limited number of genes. The study describing a detailed map of neuronal splicing has been published in Nature Neuroscience. The generation and analysis of the extensive data sets is part of the EU-funded project "SPLICECODE".
http://swissinnovation.org/news/web/2019/03-190902-75

Nanovolcanoes to Study Heart Cells

(EPFL, September 04, 2019)

Cells are the smallest living units in the human body. Excitable cells such as neurons and cardiac muscle cells use electrical signals to communicate with each other. Scientists study the signals under normal brain and heart functions using electrodes inside or outside the cell membrane. Scientists of EPFL and University of Bern have cooperated to develop a new microelectrode which penetrates the cell membrane unassisted and allows the scientists to follow the electrical activity as it spreads through tissue. The team took the best features

of the existing technologies and developed a volcano-shaped design. Using nanovolcano arrays, scientists can measure action potentials at multiple locations in a cell culture simultaneously, providing a wealth of insights into how cardiac muscle cells interact. These nanovolcanoes have applications far beyond cardiac electrophysiology, for instance in the pharmaceutical industry.
http://swissinnovation.org/news/web/2019/03-190904-ee

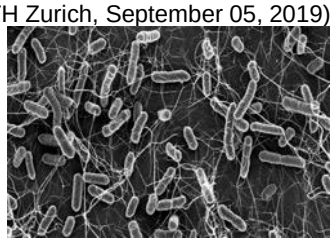
Vontobel Prize for Medical Research

(University of Zurich, September 05, 2019)

A scientist of the University of Zurich has received the Vontobel-Award for her high-level research in geriatrics. Burcu Demiray is the head of a research group at the psychological institute at UZH. She conducted research into how and why elderly people remember certain things in their everyday life. As compared to observational studies - formerly the only available data - her study highlights how elderly people's memory is specifically used in certain everyday situations. It shows that elderly people use their cognitive activities targeted and in a situationally flexible manner. A second prize went to a doctor of University Hospital Basel who collected data on spine operations of patients above 90 years of age. A third prize was given to a postdoctoral researcher at UZH who conducted research on various models of palliative care.
http://swissinnovation.org/news/web/2019/03-190905-b0

Bacterial Resistance Can Spread Without Antibiotics

(ETH Zurich, September 05, 2019)



Bacteria are becoming increasingly resistant to common antibiotics. Often, resistance is mediated by resistance genes, which can simply jump from one bacterial population to the next. It's a common assumption that the resistance genes spread primarily when antibiotics are used, however, this is not the whole story, as ETH Zurich researchers have showed in a recent study. In experiments with mice, the researchers demonstrated that dormant salmonella in the gut can pass their resistance genes on to other individual bacteria of the same species and even to other species, such as E. coli from the normal intestinal flora. Even though it is very important, reducing antibiotic use alone is not sufficient to curtail resistance, and should be done in conjunction with measures to prevent infection with resistant germs.
http://swissinnovation.org/news/web/2019/03-190905-18

Diet Pill with No Side Effects

(University of Zurich, September 10, 2019)

Being obese or overweight is one of the most widespread diseases of the 21st century, around the globe as much as within the Swiss population. Around 41% of adults and almost one fifth of young people are overweight. These conditions come at a high cost to society as it is a risk factor for cardiovascular diseases, type 2 diabetes, some types of cancer, respiratory and musculoskeletal problems. Ways and offers to lose weight are plentiful: surgery, sport, diet changes or medicine. Two scientists of University of Zurich have conducted research into this field and have plans to bring a new appetite suppressant on the market. Many anti-obesity drugs are not very effective or have unwanted side effect but their pill is a potent, side-effect free and highly selective appetite suppressant. Their spin-off start-up EraCal Therapeutics has recently been named one of the best 100 Swiss start-ups.
http://swissinnovation.org/news/web/2019/03-190910-f2

Popular mesoSPIM Microscope

(University of Zurich, September 16, 2019)

When Swiss Neuroscientist Fabian Voigt did not find a microscope to fit his need, he developed one himself. The then PhD candidate was working in Fritjof Helmchen's lab when a neuropathologist inquired about a microscope to examine larger sample sizes using light sectioning. When checking for something suitable on the market, Voigt realized that none of the microscopes met the requirements – and he thus started developing a suitable microscope himself. Achieving the desired resolution is tricky and requires the right light intensity, speed and mode of the laser scanning technology. Even just preparing the samples is a science itself. After Voigt assembled a prototype at the Brain Research Institute and managed to get software and hardware to work, a second prototype of the mesoscale selective plane illumination microscope, or mesoSPIM, was produced. When suddenly more enquiries about the mesoSPIM came, Voigt decided to make the procedure's details available on a website and publish an article about it. This is a prime example of how open science can result in excellent inventions and outcomes.
http://swissinnovation.org/news/web/2019/03-190916-40

Pitfalls of Insect Consumption

(ETHZ, September 23, 2019)

An ETH Zurich researcher has recently warned that the consumption of insects might not only have positive aspects and that the general public should be careful about the hype. His doubts are justified as there is no clear indication whether eating insects does in fact reduce meat consumption. A viable alternative would be to reduce the amount of meat that is consumed instead of promoting insect consumption too much. The issue is that insect production will never be a sustainable option as long as they are raised with high-quality feed which could be used for other purposes. In Europe this translates into feeding insects with a mixture based on rye or wheat flour. A new initiative tries to feed insects with biowaste so they can recycle biowaste more efficiently. Meanwhile, problematic is if contaminated substances end up in such waste product and make it into the supply chain through the insects.
http://swissinnovation.org/news/web/2019/03-190923-d2

Artificial Skin for Rehabilitation

(EPFL, September 27, 2019)

There is an ever-stronger focus on technology capable of replicating our sense of touch, known as haptic feedback. This can greatly enhance human-computer and human-robot interfaces for applications such as medical rehabilitation and virtual reality. Two labs of EPFL have teamed up and are developing soft, flexible artificial skin made of silicone and electrodes. The skin's system of soft sensors and actuators enable the artificial skin to conform to the exact shape of a wearer's wrist, for example, and provide haptic feedback in the form of pressure and vibration. Strain sensors continuously measure the skin's deformation so that the haptic feedback can be adjusted in real time to produce a sense of touch that's as realistic as possible. In a next step, the team wants to develop a fully wearable prototype for applications in rehabilitation, virtual and augmented reality.
http://swissinnovation.org/news/web/2019/03-190927-19

4. Nano / Micro Technology / Material Science

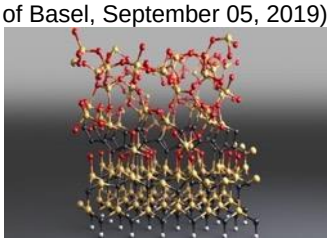
Recycling Plastic to Create Low-Cost Prosthetics

(EPFL, August 26, 2019)

In Switzerland, PET is the only kind of household plastic which is recycled. However, there are six other varieties of plastic, such as polyethylene. In an attempt to decrease the amount of plastic that is burned tossed into the sea or left to decompose into microparticles, an EPFL master's student has started looking into the various kinds of plastic. She started collecting all kinds of garbage on the EPFL campus and examine them in the laboratory to see how they differ in melting point. Through her master's project, she is, on one hand, developing ways to recycle a wider variety of plastics and, on the other hand, using recycled plastic in 3D printers to make low-cost prosthetics for war victims in Colombia. The student with a background in mechanical engineering mentioned that she would like to pursue a career in the field of plastics-recycling.
http://swissinnovation.org/news/web/2019/04-190826-0d

Silicon Carbide as the new Semiconductor

(University of Basel, September 05, 2019)



Energy consumption is growing across the globe; electric power is being relied upon more and more, and sustainable energy supplies such as wind and solar power are becoming increasingly important. Electric power, however, is often generated a long distance away from the consumer. Efficient distribution and transport systems are thus just as crucial as transformer stations and power converters that turn the generated direct current into alternating current. Current transistors made of semiconductor materials are mostly based on the element silicon, however, the silicon carbide (SiC) would be better suited. SiC has better energy efficiency leading to high savings and the heat resistance is much better than in silicon. Scientists of the University of Basel and the Paul Scherrer Institute have demonstrated this in experiments. These advantages are significantly compromised by defects at the interface between SiC and the insulating material silicon dioxide. However, if certain processes are changed the defects can be prevented.
http://swissinnovation.org/news/web/2019/04-190905-8c

Programming Wood into Desired Shapes

(ETH Zurich, September 17, 2019)

Wood is a renewable resource and a popular, sustainable construction material, however, for complex architectural designs with twists, it poses a challenge. To reshape wood, large machines that are very energy-intensive are often used. Researchers from ETH Zurich, Empa and the University of Stuttgart have developed a new technique involving a controlled drying process that makes wooden panels bend into a pre-set shape. This does not require any use of mechanical force and is based on the natural swelling and shrinking of wood through moisture. When damp wood dries, it contracts more strongly perpendicular to the grain than along the grain. This warpage is normally an undesirable effect, but the researchers have taken advantage of the property by putting two layers of wood together so that their grain directions are opposed to each other. When the water dries, one layer shrinks more than the other, allowing a wide range of shapes. The technique is dubbed "Wood programming".
http://swissinnovation.org/news/web/2019/04-190917-d7

Versatile Chips that Measure Vacuums Precisely

(EPFL, September 24, 2019)

Vacuums are a vital part of production processes – like freeze-drying – used to make and preserve countless everyday items, and must be measured with precision. An EPFL spin-off, Hexisense, is bringing to market a small gallium nitride-based chip that can measure the quantity of certain gas molecules cheaply and with unrivalled precision. These all-purpose chips are heat-resistant up to 250°C and do not contain any microelectromechanical systems, so they can withstand mechanical vibrations and shocks. Moreover, unlike low-pressure ionization-based vacuum gauges, they do not produce ionized particles or magnetic fields that could affect certain technical equipment. These advantages make the new-generation chips highly versatile, making life easier for their users because they can just place the chips within their pressure systems to obtain the data they need.
http://swissinnovation.org/news/web/2019/04-190924-c3

Bendable Battery

(ETH Zurich, September 24, 2019)

The electronics industry increasingly relies on smart devices with foldable screens. Additionally, smart clothing items make use of wearable micro-devices and sensors to monitor bodily functions. All of these devices need an energy source and often this source is a lithium-ion battery. Meanwhile problematic with commercial batteries is that they are heavy and rigid, making it fundamentally unsuitable for applications in flexible electronics or textiles. An ETH Zurich researcher and his team came up with a solution to this problem: They have developed a prototype for a flexible thin-film battery that can be bent, stretched and even twisted without interrupting the supply of power. The special part of the battery is the electrolyte, namely the part of the battery through which lithium-ions move when the battery is discharged or charged. It's the first time exclusively flexible components have been used to create a battery.
http://swissinnovation.org/news/web/2019/04-190924-09

5. Information & Communications Technology

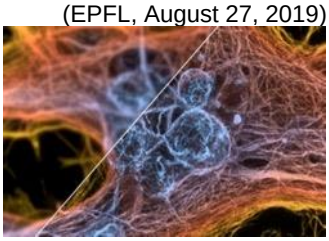
Facing the Challenges of Brain-Computer Interfaces

(ETH Zurich, August 09, 2019)

Brain-computer interfaces (BCIs) allow people with severe physical or speech disabilities to interact and communicate with their surroundings using their thoughts interpreted by a computer. However, BCI technology as a whole is still very much in its infancy. There are many reasons for the limited transfer of BCIs into routine applications. Invasive BCI systems with implanted electrodes, for example, require neurosurgery, carry the risk of infection and the signal quality of the electrodes currently used deteriorates over the months. This type of intervention is therefore only justified in severe cases. Although non-invasive BCI systems are much safer and more common, they also have many weaknesses: their signal quality is much worse. Despite these challenges, BCIs are important research tools. They make it possible to learn more about the function and organisation of the brain, for example the way it reorganises after a stroke. After ETH Zurich's success in 2016 with the first CYBATHLON, a unique championship in which people with physical disabilities compete against each other to complete everyday tasks using state-of-the-art technical assistance systems, another CYBATHLON will be held on 2 – 3 May 2020.
http://swissinnovation.org/news/web/2019/05-190809-ce

Universal Algorithm Determines Whether Super-Resolution Microscope Operates at Maximum Resolution

(EPFL, August 27, 2019)



EPFL scientists have developed an algorithm that can determine whether a super-resolution microscope is operating at maximum resolution based on a single image. The method is compatible with all types of microscopes and could one day be a standard feature of automated models. This addresses a common issue where the image quality of those super-resolution microscopes varies greatly depending on the configuration of the instrument being used. The algorithm's result indicates how closely a microscope is operating to its full potential. This could be particularly useful for the automated microscopes that have started appearing in research labs.
http://swissinnovation.org/news/web/2019/05-190827-0d

6. Energy / Environment

Super Water-Efficient Smart Urban Greenhouses

(EPFL, August 05, 2019)

Two master's students of EPFL have co-developed a technology which allows to grow a small garden at home or in the office, so-called smart greenhouses. In order to market and commercialize their innovation, the students have founded a startup by the name of Caulys'. Their connected indoor greenhouses allow to grow herbs, vegetables or fruit in the middle of a city. The goal is to help urban areas become a producer of fresh and local products or as the inventors frame it "bring agriculture downtown". Using a technology consisting of modules, each smart greenhouse can have up to 4 shelves and 200 plants. Sensors and LEDs continually monitor and adjust the systems' light, temperature and humidity and as their technology uses a closed-loop irrigation system, Caulys' greenhouses use up to 95% less water than conventional ones.
http://swissinnovation.org/news/web/2019/06-190805-52

Swiss Recycling-Roadmap for Car Batteries

(Empa, August 12, 2019)

Around 40,000 electric cars and hybrids with lithium-ion batteries are currently driving on Swiss roads, and this number is likely to increase. The association "auto-schweiz", which represents most car importers in Switzerland, has commissioned the Swiss Auto Recycling Foundation to develop a Swiss recycling system for car batteries. This foundation has been responsible for the dismantling and recycling of end-of-life vehicles. Since March 2019, Empa, who has already advised other industry associations on the recycling of electronic devices, is a partner of this project. Together they analyze recycling systems in neighboring countries, examine costs and the ecological footprint, make estimates of the future quantities of old batteries – and, finally, recommend appropriate strategies for Switzerland.
http://swissinnovation.org/news/web/2019/06-190812-16

Most Comprehensive Permafrost Monitoring Research Worldwide

(University of Zurich, August 13, 2019)

In the summer of 2003, a 1,500 cubic meter rock broke off Matterhorn's Hörnli ridge. The fracture event exposed bare ice on the surface of the steep scarp. Experts soon realized that the record temperatures had warmed the rock that the ice contained in its pores and fissures had melted and caused this fracture event. The unpredicted rockfall was the incentive for setting up PermaSense, a unique project consortium bringing together experts from different engineering and environmental research disciplines of ETH Zurich, universities of Zurich and Basel. The initial goal was to make measurements and observations that had not previously been possible. The study describes a unique ten-year record of high-resolution data captured by scientists on the Hörnli ridge which constitutes the longest, densest and most diverse data record in the history of alpine permafrost research worldwide. The technical and geological expertise acquired can now be applied to the forecasting of natural hazard event.
http://swissinnovation.org/news/web/2019/06-190813-da

Novel Accelerator-Based Approach For Cleaner Cruises

(CERN, August 13, 2019)

Maritime traffic is the single largest contributor to air pollution – a single cruise ship emits as much pollution as one million cars. Several technologies are being explored to reduce the pollutants in the exhausts of ships' diesel engines. Accelerator scientists have proposed a solution that involves breaking down particulate matter as well as molecules of sulphur and nitrogen oxides with an electron-beam accelerator of a few hundred kilovolts, before safely extracting them using water. The ARIES (Accelerator Research and Innovation for European Science and Society) Horizon 2020 project, coordinated by CERN, is currently working on a real-scale test of this technology.
http://swissinnovation.org/news/web/2019/06-190813-ec

Heatwaves Cause More Emergency Admissions into Hospitals

(University of Basel, August 15, 2019)

The heat summer of 2015 - the second hottest summer in Switzerland since 2003 - led to over 2,700 additional emergency admissions in Swiss hospitals. Former studies have shown that heat waves cause increased mortality rates, however, only a few studies have investigated the effects of heatwaves on morbidity. Researchers from the University of Basel conducted a detailed analysis of emergency hospital admissions in Switzerland during the three heatwaves between June and August 2015. They found that the most vulnerable populations were the elderly and residents of Switzerland's warmest regions: Ticino and Lake Geneva. Meanwhile, surprising were the most common causes of the emergency hospital admissions: Infectious diseases, diseases of the genitourinary system, diseases of the digestive system, as well as influenza and pneumonia. They are surprising insofar as it is cardiovascular and respiratory diseases which play leading roles in heat-related deaths. The study authors recommend that the Swiss cantonal heat-health action plans be expanded in line with the study's findings.
http://swissinnovation.org/news/web/2019/06-190815-a5

20 Percent Fuel Savings Thanks To A New Technology

(Empa, August 19, 2019)

Internal combustion engines require valves to aspirate and discharge gases. Up to now, the gas exchange valves of four-stroke engines have been controlled through camshaft drives. Despite some complex additional mechanics, the flexibility of such camshaft driven system remains limited. Empa has now developed an innovative, electrohydraulically actuated valve train that enables completely free adjustment of stroke and timing, while at the same time being robust and cost-effective. This valve train was mounted on a serial production engine and has been running successfully in test bench operation for several months. The new technology saves up to 20 percent fuel in the low load range typical for passenger cars.
http://swissinnovation.org/news/web/2019/06-190819-55

Reducing Risks of Melting Glaciers

(EPFL, August 20, 2019)

As glaciers melt, glacial lakes are created. With the effects of climate change, this can cause flooding and landslides. A team of experts from EPFL, the University of Zurich, and the Center for Research on the Alpine Environment (CREALP) are studying one possible solution to this problem: the controlled use of water from those lakes. Funded by the Swiss Agency for Development and Cooperation and in association with the NGO Care Peru and a number of Peruvian institutions, they are setting up measurement stations at glacial lakes in the Andes Mountains to predict the water flow rate and the lake behavior in case if a piece of large rock or glacier ice suddenly fell into a lake. Of successful, this eight-year research project, called GLACIARES+, will help to protect more than 1.5 million local residents that are potentially threatened by glacial retreat in the Andes, and eventually around the globe.
http://swissinnovation.org/news/web/2019/06-190820-11

Intelligent Facade to Regulate Building Climate

(ETH Zurich, August 23, 2019)

Achieving comfortable temperatures in a building throughout the seasons requires energy - energy to cool in summer and to heat in winter. If more intelligent building's facades are achieved, the energy-efficiency could be increased significantly. At ETH Zurich, researchers have developed an adaptive solar facade system that regulates individual rooms in a way to achieve an energy surplus over the course of the year. This means that the building would produce more energy than it consumes. The facade is made of movable solar panels set up on a network of lightweight steel cables, which can be controlled and moved individually by a soft robotic element. The panels can withstand even very harsh weather conditions such as storms. The panels additionally regulate the amount of light and heat permeating the building and thus regulate the inside temperature. This intelligent facade shows the biggest potential in temperate climate zones in buildings constructed to the latest standards.
http://swissinnovation.org/news/web/2019/06-190823-46

Earlier Grape Harvest Indicates Climate Change Impact

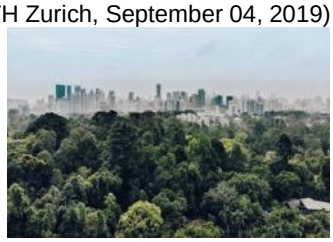
(University of Bern, August 29, 2019)

For the past 30 years, grape harvesting in Burgundy has started 13 days earlier than it has during the preceding 664 years. A recently published data series has indicated this result, which was - among other institutions - analyzed by the University of Bern. Grapes are ideal to make statements on climate change as the fruit reacts highly sensitive to temperature variations and rain. According to the scientist, the trend to such an obvious acceleration in global warming caught them by surprise. Two phases are clearly distinguishable when looking at the harvest data, one prior to 1988 and one thereafter. Prior to 1988, the

grape harvest has typically started from September 28, however since 1988 data shows that the harvest began on average 13 days earlier than what used to be the normal case. The data series allows a temperature estimate for the past 360 years for the period between April and July. The researchers underline how important it is to act quickly on climate change now.
http://swissinnovation.org/news/web/2019/06-190829-bd

Cooling Cities in Different Climate Zones

(ETH Zurich, September 04, 2019)



Urban heat islands are a phenomenon where the temperature in a city is noticeably higher than in the surrounding rural area. The urban heat island phenomenon is more pronounced the bigger the city and the more rainfall in that region. In combination with a heatwave, urban heat can pose a real threat to the elderly or sick people. ETH scientists have been researching the effect of precipitation and population size on rising temperatures in cities compared with the surrounding countryside. They have found that more green spaces can help to lower temperatures in urban zones, but this depends on whether a city is in a dry or a tropical zone. Cities in dry zones can achieve cooler temperatures through targeted planting, however, for cities in tropical zones other cooling methods are more effective, such as increased wind circulation or more use of shade.
http://swissinnovation.org/news/web/2019/06-190904-18

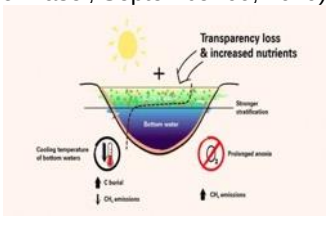
Effect of Interest Rates on Renewable Energy

(ETH Zurich, September 09, 2019)

Renewable energy is an essential part of efforts to reduce CO2 emissions, and therefore, policy makers have introduced successful support measures. A broad emergence of photovoltaic plants has been seen recently, which can survive on the market without subsidies. An important and often overlooked factor is the low cost of capital which has boosted the economic feasibility of alternative energy sources. However, what if the interest rates rise? Researchers of ETH Zurich have examined this question. In short: As renewable energy is more capital-intensive than fossil fuels, the costs rise more sharply with rising interest rates making it less attractive. In interest rate scenarios, the researchers found that the electricity generation cost of solar and wind power could increase by up to 11% and 25%, respectively. Their policy advice is that continued adherence to market-based instruments, such as auctions for large-scale plants to generate renewable energy is a key factor.
http://swissinnovation.org/news/web/2019/06-190909-fb

Unexpected Climate Effects of Lakes

(University of Basel, September 09, 2019)



Lakes play an important role in the global carbon cycle, acting as large natural bioreactors. The temperature of a lake represents an important constraint on the amount of carbon dioxide and methane it emits into the atmosphere. An international research team where the University of Basel was involved has examined these interactions more closely and discovered unexpected effects. Lakes worldwide are warming at the surface. However, they are also losing transparency due to increased algae production, which in turn causes more heat to be trapped in the upper layers of the lakes, leaving the deeper waters thermally isolated. This can lead to a cooling of the water masses near the bottom of lakes and cause a slowing of carbon dioxide production. The increased differential warming has another effect: the deeper water layers do barely mix and are poorly ventilated, leading to oxygen-free conditions which enhance methane production.
http://swissinnovation.org/news/web/2019/06-190909-eb

Disease-Resistant Bean Breeding

(ETH Zurich, September 11, 2019)

Historically described as “the meat of the poor”, beans are rich in protein and minerals, affordable and suitably filling. That is why they are served daily, often with several meals in areas like Africa or Latin America. Due to plant diseases, the bean yield in certain regions has decreased up to 80%. A research team of ETH Zurich has examined the angular leaf spot disease and beans' resistance to it. Their method is built upon genome analyses of those beans that are potentially suitable for breeding new, resistant varieties. The research could allow to breed disease-resistant bean varieties more rapidly in such regions. Thanks to more disease-resistant beans, the global use of pesticides can be cut down. Additionally, the researchers published the study open access because in that way the work reaches the countries concerned.
http://swissinnovation.org/news/web/2019/06-190911-67

Major Alps Glacier Will Melt Until End of Century

(ETH Zurich, September 12, 2019)

The largest ice flow in the Alps, the Great Aletsch Glacier is a major tourism draw in the Swiss region of Upper Valais, second only to the Matterhorn. However, as the climate becomes ever warmer, the massive glacier is suffering. The Aletsch Glacier’s tongue has receded by about one kilometre since the year 2000, and scientists predict this trend will continue over the coming years. In a detailed simulation, two ETH Zurich researchers have tested how the Aletsch Glacier will change over the coming years. They applied a 3D glacier model that allows them to map the dynamics of an individual glacier in detail. The best-case scenario would be if global warming could be limited to less than 2 degrees Celsius soon, so that climate stabilizes until 2040. In that case still more than 50% would melt until the end of the century as glaciers are very slow to react to climate changes.
http://swissinnovation.org/news/web/2019/06-190912-12

Light Levels Influence People's Thermal Perception

(EPFL, September 19, 2019)

For a long time, the difference between our perception and reality has been a topic for philosophers and other disciplines. Scientists of EPFL have conducted a pioneering study and discovered a significant psychological factor that is associated with daylight and alters the thermal perception of a person. The study involved 42 males and 42 females between 18-25 years old, a room set to one of three temperatures with one of three illuminance levels. The participants were not made aware what the purpose of the study was and were given various task that also included questionnaires asking abour their comfort levels within the room. It turned out that participants felt more comfortable in a cooler room with more light as well as in a warmer room with less light - even though there was no difference in body temperature. This led to the groundbreaking conclusion that illumination levels do influence the thermal perception of people.
http://swissinnovation.org/news/web/2019/06-190919-80

7. Engineering / Robotics / Space

Developing Self-Healing Robots that can Feel Pain

(Empa, August 08, 2019)

Over the next three years, researchers from the Vrije Universiteit Brussel, University of Cambridge, École Supérieure de Physique et de Chimie Industrielles de la ville de Paris (ESPCI-Paris) and Empa will be working together with a Dutch Polymer manufacturer on the next generation of robots: (soft) robots that 'feel pain' and heal themselves. The scientists will focus on developing technologies within the new SHERO project that allow soft robots to self-heal damage. Because this repair process should not involve humans, the researchers are looking into self-healing materials to build the soft robots with. These flexible plastics can completely heal themselves when they are damaged. Imbedded functional material will assists to sense and actuate the self healing process. The ambitious goal of the European project is to create a soft robot made from a self-healing material, which can detect damage, take the necessary steps to (temporarily) heal the defect, provisionally as to complete the work in progress, or more completely during the service operation.
http://swissinnovation.org/news/web/2019/07-190808-46

The First Entirely Soft Pump

(EPFL, August 14, 2019)

Researchers from EPFL in collaboration with the Shibaura Institute of Technology in Tokyo, Japan, have developed a tiny pump that could play a big role in the development of autonomous soft robots, lightweight exoskeletons and smart clothing. Flexible, silent and weighing only one gram, it is poised to replace the rigid, noisy and bulky pumps currently used. The EPFL team has also fitted a fabric glove with tubes and has shown that it is possible to heat or cool regions of the glove using the pump. This application has already sparked interest from a number of companies.
http://swissinnovation.org/news/web/2019/07-190814-0d

Jupiter's Core Fuzzy Due to Massive Collision

(University of Zurich, August 15, 2019)

Data collected by NASA's Juno mission suggests that Jupiter, instead of having a small compact core, rather has a diluted, fuzzy one. An international research team in which scientist of the University of Zurich are involved found an explanation for this surprising result. After the Juno probe delivered accurate gravity data, researchers had to revise their theories about Jupiters core. It is likely that it is not made of only rock and ice - as was assumed - but is mixed with hydrogen and helium. The international research team has conducted computer simulation and theorizes that a giant impact caused this particularity. An enormous collision between Jupiter and an impactor 10 times the mass of Earth caused Jupiter's primordial compact core to shatter and mix with the inner envelope which contains helium and hydrogen. The research suggest that such impacts played an important role for shaping the planetary characteristics.
http://swissinnovation.org/news/web/2019/07-190815-62

Cutting Edge AI and Bio-Inspired Robotics Research

(University of Zurich, August 21, 2019)

Humans and machines have a long history of co-existence, but artificial intelligence (AI) threatens to disrupt this delicate balance. Scientists at the University of Zurich are investigating the consequences of the advances of robotic technology. One team is working on the frontiers of what neural architectures are capable of today: The team develops programs for robots that allow them to navigate independently in unfamiliar environments. First the robots must be able to recognize their environment and then react to it appropriately. Another team is looking at the philosophical angle of robotics: What feelings do intelligent machines trigger in humans, and are these feelings good or bad? Another team is looking at how machines automate and transform the working life. It is not a recent development, however, but something that has been happening since the beginning of the industrial revolution. In principle, humanity has benefited from the use of machines, because they save us a lot of work, increase our productivity and in turn raise our standard of living. In earlier times, it was primarily manual labor that was replaced by machines. This has changed since computers became capable of independently performing cognitive tasks.
http://swissinnovation.org/news/web/2019/07-190821-86

HydroContest Lightboat Race

(EPFL, September 10, 2019)

A dozen European teams from six countries participated this year in the event organized in Yverdon by the three French-language universities: EPFL, the Haute école d'ingénierie et d'architecture de Fribourg (HeiaFR), and the Haute école d'ingénierie et de gestion du canton de Vaud (Heig-VD). EPFL turned out to be the lucky winner of the contest as the team took first place in the nautical competition with its lightweight boat. The final race was a close call between Heig-VD and EPFL with a total of five runs necessary for EPFL to win 3-2. The Croatian Academy of Engineering also distinguished itself in terms of efficiency, surpassing HeiaFR and Heig-VD with its heavyweight boat. On the strength of their success, Lausanne students are already thinking about 2020. They aim to build a Swiss Solar Boat, and will use their current prototypes as test platforms for the 2020 Monaco Solar & Energy Boat Challenge.
http://swissinnovation.org/news/web/2019/07-190910-09

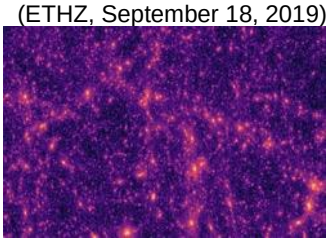
Prosthetic Hand Combining Two Disciplines

(EPFL, September 11, 2019)

EPFL scientists have successfully tested new neuroprosthetic technology that combines robotic control with users' voluntary control in robotic hands. The technology merges two concepts from two different fields. Firstly, a concept from neuroengineering, which involves deciphering intended finger movement from muscular activity on the amputee's stump for individual finger control of the prosthetic hand. The second concept is from robotics and allows the robotic hand to help take hold of objects and maintain contact with them for robust grasping. The algorithm first learns how to decode user intention and translates this into finger movement of the prosthetic hand. but as muscle signals can be noisy, machine learning helps extract and interpret the activity into movements. Many challenges remain to engineer the algorithm before it can be implemented in a commercially available prosthetic hand for amputees. For now, the algorithm is still being tested on a robot provided by an external party.
http://swissinnovation.org/news/web/2019/07-190911-f3

Solving Dark Matter Mysteries With Facebook-Like Algorithms

(ETHZ, September 18, 2019)



A big mystery that cannot be perceived by us is dark matter and dark energy. Whereas the former pulls the universe together, the latter causes it to expand faster and cosmologists need to know exactly how much of those two is out there in order to refine their models. A team of physicist and computer scientists of ETH Zurich have developed a new approach to investigate dark matter and energy. By using machine learning and artificial intelligence algorithms that are similar to facial recognition tools that Facebook uses, programmed computers analyze cosmological data and look for the tell-tale signs of dark matter and dark energy. The physicist namely rely on the fact that all matter slightly bends the path of light rays arriving at the Earth from distant galaxies. The tool learns and improves itself and first results are promising: The neural networks achieved values that were 30% more accurate than those obtained by traditional methods.
http://swissinnovation.org/news/web/2019/07-190918-97

8. Physics / Chemistry / Math

CERN Theorist Receives Prestigious Physics Prize

(CERN, August 06, 2019)

Sergio Ferrara, a theorist at CERN, has recently been awarded the Special Breakthrough Prize in Fundamental Physics alongside Daniel Z. Freedman of MIT and Peter van Nieuwenhuizen of Stony Brook University. The trio received the award for their 1976 invention of the theory of supergravity, which merges Einstein's theory of general relativity and the theory of supersymmetry. Ferrara mentioned how surprising this award has been to him and that none of the three expected it. He was a CERN fellow from 1973 to 1975 and has been a CERN staff member since the 80s. The Special Breakthrough Prize is awarded at any time and not limited to recent discoveries.
http://swissinnovation.org/news/web/2019/12-190806-c4

Understanding Strong Magnetic Fields thanks to Neutrons

(Paul Scherrer Institut, August 22, 2019)

Neutrons are electrically neutral and interact with magnetic fields due to their so-called spin. Researchers at the Paul Scherrer Institute (PSI) have shown that this property can be used to visualize magnetic fields. When sending a beam of neutrons of all the same spin through a magnetic field, a refraction of the neutron beam can be detected behind this field. From the refraction pattern, the magnetic field and the differences in field strengths can be reconstructed. This method, also known as polarized neutron grating interferometry (pnGI), can be used to measure very strong magnetic fields (about one million times stronger than Earth's magnetic field). The scientists think of numerous applications since neutrons penetrate most materials in a non-destructive way. Even magnetic fields that are difficult to access because they are already built into an apparatus could be measured with pnGI.
http://swissinnovation.org/news/web/2019/08-190822-76

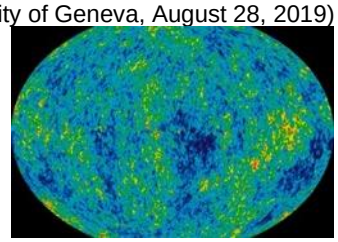
Philosophy of Time Travel

(ETH Zurich, August 22, 2019)

How realistic is the movie plot of Back to the Future? Time traveling is integral to many science fiction stories and philosophical discussions. During Scientifica 2019, a science festival held at ETH and the University of Zurich, the physicist and philosopher Norman Sieroka shed light on the fourth dimension and the human perception of it. In physics there are theories in which time travel is possible: Under certain conditions, the general theory of relativity allows closed, time-like loops. Space and time are then not independent of each other, but defined by geometry. If it bent so much that the space-time curves reach their starting point, courageous astronauts who travel through such a loop would then return to a point in time where they "had already been" or which "had already existed". However, there are different other philosophical theories, some of which correspond a bit more closely with the human conception of time. Sieroka's research is also targeting quantum physics and could be used in understanding the requirements for quantum clocks.
http://swissinnovation.org/news/web/2019/08-190822-37

Cosmological Problem

(University of Geneva, August 28, 2019)



A physicist from the University of Geneva has proposed a new approach to solving one of the biggest problems in physics: the cosmological constant. Introduced a century ago by Albert Einstein in his theory of general relativity, the cosmological constant is considered the worst estimate in the history of physics. A new mathematical manipulation of the equations of general relativity now makes it finally possible to harmonize theory and observation of the cosmological constant. Lucas Lombriser, assistant professor in the Department of Theoretical Physics, suggests that another constant in the equations – Newton's universal gravitation G – may actually vary. Using this new approach to calculate the dark energy fraction of the universe, Lombriser got a theoretical value of 70.4%. This is in close agreement with the best experimental estimate, which is 68.5%. The initial success now needs to be followed by further analyses and verifications.
http://swissinnovation.org/news/web/2019/08-190828-70

Generating Ultra-Fast Pulse Trains

(EPFL, September 09, 2019)

Optical microresonators convert laser light into ultrashort pulses travelling around the resonator's circumference. These pulses, called "dissipative Kerr solitons", can propagate in the microresonator maintaining their shape. When solitons exit the microresonator, the output light takes the form of a series of repeating pulses with fixed intervals, a so-called pulse train. This technology which is relevant for ultrafast LiDAR suffers from a loss of light caused by structural bends in its path. Researchers of EPFL have now found a way to circumvent this limitation and uncouple the pulse repetition rate from the microresonator size by generating multiple solitons in a single microresonator. This allows the generation of optical pulse trains with ultra-high repetition rates with several terahertz, using regular microresonators. This can be used for applications such as spectroscopy, distance measurements, and it additionally opens new doors to a better understanding of fundamental physics of soliton ensembles in nonlinear systems.
http://swissinnovation.org/news/web/2019/08-190909-87

Device Recognizes Ethanol and Deadly Methanol

(ETH Zurich, September 18, 2019)

Methanol is sometimes referred to as ethanol's deadly twin. While the latter is the intoxicating ingredient in wine, beer and schnapps, the former is a chemical that becomes highly toxic when metabolised by the human body. Already small amounts can incur death or lead to blindness. Mainly in third world countries where alcohol is often home-brewed, knowing whether a beverage contains ethanol or methanol can save lives. To help with this issue ETH researchers have developed an inexpensive, handheld measuring device that can distinguish between methanol and potable alcohol. It offers a simple, quick method of detecting adulterated or contaminated alcoholic beverages and is able to diagnose methanol poisoning in exhaled breath. Additionally, methanol is being considered as a potential future fuel, since vehicles can be powered with methanol fuel cells, thus, another application for the new technology could be as an alarm sensor to detect leaks in tanks.
http://swissinnovation.org/news/web/2019/08-190918-d3

9. Architecture / Design

Furniture Design to Combat Wood Waste

(EPFL, August 12, 2019)

Students at EPFL realized that the recycling bins of the university contained a lot of wood waste. They thought that the wood could be useful and decided to bring to life a project focusing on it. The five students who work on the project together, named it CHEAP, for Catalog of Handmade Elements Assembled from Pallets. Based on the most widely used type of pallets in Switzerland, the CHEAP catalog presents seven easily replicable designs: table, chairs, a bar and stool set, a lounge chair, a bench, a coffee table and planters. The pieces are designed to leave behind the least amount of wood scrap possible, resulting in a series of unique pieces. A number of them will be displayed at strategic spots on campus to help raise awareness of the problem of wood waste.
http://swissinnovation.org/news/web/2019/09-190812-43

Maps to Better Understand History

(University of Zurich, August 29, 2019)

At the Division for Eastern European History of the University of Zurich, students are taught how to handle maps and charts in a project supported by the Teaching Fund. They are using the open-source software QGIS to practice the basics of cartography. The Teaching Fund project aims to develop a didactic set of maps that critically visualizes key media-specific dimensions of representation in historical maps by showing the same topic from different angles. Visualizing data allows students to quickly grasp several characteristics of an unknown territory at once. The student's work is thus both illustrative and documentary.
http://swissinnovation.org/news/web/2019/09-190829-fd

Jewelry Using EPFL Light Reflection Technology

(EPFL, September 09, 2019)

THE RAYY is a Swiss jewelry startup which has launched a collection of unique, stylish rings that employ technology developed at EPFL. At first glance, the rings of THE RAYY look like normal pieces of jewelry, however, if light shines on them, they reflect it in a certain way and form words. The surface of the pieces seems smooth but in fact they are structured. The EPFL researchers who invented the technology studied

caustics, which refers to the way light rays reflect off a surface and form patterns on another surface, like on the bottom of a swimming pool. Inspired by this, the researchers tried to manipulate and control the caustic to create precise images, words or symbols. Additionally, the scientists' technology could identify counterfeits, such as fake watches and documents. As of now, they are not on the market yet but according to one of the scientists, the R&D is underway.
http://swissinnovation.org/news/web/2019/09-190909-cf

10. Economy, Social Sciences & Humanities

Certificate of Advanced Studies in Negotiation and Intercultural Values

(University of Neuchatel, August 19, 2019)

As the economic environment becomes globalized and internationalized, companies or administrations are increasingly coming into contact with numerous countries whose customs and ways of doing business, communicating and negotiating vary greatly. The University of Neuchâtel is launching a new Certificate of Advanced Studies (CAS) in Negotiation and Intercultural Values – unique in Switzerland – for entrepreneurs and executives of companies/administrations operating in China, the United States, India, Japan and Russia. The program addresses general, legal and economic theories and issues, while focusing on negotiation challenges in these five contexts, which together represent a huge business potential for Swiss companies. This training, which aims to improve communication and negotiation skills, will start in January 2020 (registration deadline: 15 November 2019).
http://swissinnovation.org/news/web/2019/02-190819-7b

Oldest High Mountain Settlement

(University of Bern, August 08, 2019)

The Bale Mountains, a mountain range in northeast Africa, was believed to be populated only in recent times. However, an interdisciplinary research group in which the University of Bern was involved, found that already 40'000 years ago, hunters have settled permanently in this region. This makes the area, which reaches an altitude of 4,300 meters, the oldest prehistoric settlement in a high mountain region. Three scientists of the University of Basel who were involved in the research reconstructed climatic conditions and found that a glacier used to be located close to the settlement. Nowadays, the area is located in the tropics and in spite of the altitude is unglaciated. The team found evidence that the settlers manufactured weapons from obsidian and fed on giant mole-rats.
http://swissinnovation.org/news/web/2019/10-190808-4d

Algorithm to Detect Outside Influences on the Media

(EPFL, August 09, 2019)

As media groups increasingly pool resources to cut the cost of producing stories, media concentration narrows the range of views that consumers are exposed to. News consumers may be unaware that the way their local media outlet selects and presents news stories is often affected by the media group that owns it. Researchers at EPFL's Distributed Information Systems Laboratory (LSIR) have developed an algorithm, Media Observatory, to make the news industry more transparent and make people more aware of outside influences on the media. The algorithm maps out the Swiss and international media landscape through the topics that local media outlets choose to cover. Those choices are then used to uncover biases and hidden influences in the news industry. For more information: https://www.mediaobservatory.com/
http://swissinnovation.org/news/web/2019/10-190809-24

Humans Played a Role in Cave Bear Extinction

(University of Zurich, August 16, 2019)

Researchers at the University of Zurich have investigated, where in Europe different populations of cave bears lived and how they migrated during the late Pleistocene. They reconstructed cave bear mitochondrial genomes from bone samples collected across sites in Poland, France, Spain, Germany, Italy and Serbia. The researchers identified five major mitochondrial DNA lineages originating from a common ancestor, dispersed across Europe. The drastic decline in cave bear population coincided with the spread of anatomically modern humans in Europe. The cooling climate and the reduced food availability may have fragmented the overall bear population into various subpopulations. By interrupting the connectivity between these subpopulations, humans may have played a decisive role in the species' extinction.
http://swissinnovation.org/news/web/2019/10-190816-2c

Imitating Threats and Analyzing Human Reactions

(University of Zurich, August 22, 2019)

Science has learned a lot about how animals behave when they feel under threat, however, when it comes to humans, there is a significant lack. A psychologist of University of Zurich is trying to close this knowledge gap. He tries to find out how humans react in threatening situations like attacks or accidents, how they move and what happens physically. However, researching these questions is challenging as such situations cannot easily be imitated. The researcher for instance lets the participants play video games in which they must protect their avatar from an enemy who tries to eat them. Whilst playing the game, their brain activity and movements are recorded. In the next stage, the participants will be using virtual reality to imitate as primordial situations as possible. Through these experiments, the research team hopes to find a multitude of answers, such as how to treat post traumatic stress disorder.
http://swissinnovation.org/news/web/2019/10-190822-cf

West African Drummers Making Their Voices Heard

(University of Zurich, August 26, 2019)

Much of today's popular music, including jazz, soul, reggae and hip hop, is based on West African forms of musical expression, as revealed at the new exhibition "Talking with drums" at the University of Zurich's Ethnographic Museum. The exhibition shows how revered drummers from Ghana and Nigeria combine physical skills with social and cultural knowledge to make their voices heard locally and globally. The drum sets used by various ethnic groups in different musical genres are on display. Film and sound recordings demonstrate what the music sounds like and for which events it is used. An interactive video allows visitors to dismantle a polyrhythmic piece of music into its individual rhythms and then reassemble it. The website features extensive audiovisual materials: https://talkingwithdrums.ch/?page_id=112&lang=en
http://swissinnovation.org/news/web/2019/10-190826-a0

Zero Energy Bitcoin Alternative

(EPFL, September 30, 2019)

A strong limitation of Bitcoin is its exceedingly high electricity consumption and outsized carbon footprint. A nearly zero-energy alternative sounds utopic, however, according to EPFL researchers it all depends on our understanding of what makes a transaction secure. The system developed in the Distributed Computing Lab (DCL) at EPFL represents a paradigm shift compared to the traditional Bitcoin model first described by Satoshi Nakamoto. Bitcoin relies on solving a difficult problem called "consensus" where everyone in a distributed system must agree on the validity of all transactions to guarantee the security of transactions. The new system, however, realizes that players don't need consensus but just need to

prevent malicious behavior when it manifests. It is built on the assumption that everyone is honest and that if dishonest behavior is observed by the players, they just ignore the dishonest one. The DCL's new system is named Byzantine Reliable Broadcast, can achieve safe cryptocurrency transactions on a large scale and reaches an energetic cost of virtually zero.
http://swissinnovation.org/news/web/2019/10-190930-3a

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

Swiss Fintech Unicorn

(Bloomberg, August 22, 2019)

The Swiss-based startup Numbrs has recently become a unicorn - meaning it is valued at one billion USD prior to an IPO. The company offers an app with the same name that allows users to manage their bank accounts in a single place and additionally enables them to buy financial products. The focus was mainly on private investors and over 50 individual investors and families have directed their funds into the company. The CEO, Martin Saidler, explains their focus by saying that private investors tend to be more patient than venture capital funds and private equity funds. At the current state, Numbrs is not profiteable, however, they hope to break even in two years. The app was launched in Germany and will expand to Britain, after that an entry into other European markets is expected.
http://swissinnovation.org/news/web/2019/11-190822-cc

Students Engineer Energy-Efficient Boats

(EPFL, August 28, 2019)

Every year, the HydroContest takes place, a competition where student teams engineer fast, energy-efficient boat designs. This year, the HydroContest was hosted by three Swiss universities from the French-speaking part, namely EPFL, HEIA-FR and HEIG-VD. More than 10 teams from six European countries participated in the competition which was held on Lake Neuchatel. The contest is supported by the Hydros Foundation and challenges students to design, build and race the most energy-efficient miniature boats, which are remote-controlled. No participation fee applies and it is open to the public. EPFL has participated in the contest every year since its launch and this year they competed with three different boats. One was inspired by a Indonesian prao sailboat, resulting in an asymmetric shape.
http://swissinnovation.org/news/web/2019/11-190828-53

Satellite Startup Raises USD 18 M in Funding

(EPFL, August 29, 2019)

Data-transfer needs, driven by TVs, telephones, surveillance, GPS and the internet, are growing non-stop. This requires ever more satellite bandwidth, and thus increasingly high wave frequencies. The higher the frequency the more difficult it is to control, and this is where the quality and shape of antennas play a crucial role. SWISSto12, an EPFL spin-off, uses a patented process to manufacture metal-plated 3D-printed components. The company that supplies telecommunications components to the satellite and aerospace industries, has recently announced the completion of a USD 18.1 million fundraising round. The firm will use the fresh injection of capital to ramp up marketing of its 3D-printed waveguides and expand its offices in the US and Israel.
http://swissinnovation.org/news/web/2019/11-190829-ea

Social Media Alarm-Clock

(EPFL, September 02, 2019)

A group of students from EPFL are about to launch Wakeit, a free alarm-clock app powered by social media. Their main target is the Generation Z. The app wakes people up with a selection of stories and photos that open when it's time to rise. There is also an option for users to play a game or resolve a challenge in order to turn off the alarm. In 2018, the young entrepreneurs obtained an Xgrant for their idea. These grants of up to CHF 10,000 are intended to help EPFL students who want to start an innovative business. They are now developing a beta version that should be ready for both iOS and Android smartphones in September 2019.
http://swissinnovation.org/news/web/2019/11-190902-ca

EPFL Spin-off Kandou Bus Raises USD 56 million

(EPFL, September 23, 2019)

In its latest funding round, Kandou Bus – an EPFL spin-off based at the School's Innovation Park – has raised USD 56 million, mainly from Swiss investors. The startup, created in 2011, develops IT components that improve the speed and reliability of communications between electronic devices while keeping their energy consumption to a minimum. Kandou Bus' advances have already led to the revision of several industry standards. So far it has marketed its systems through licenses but it is now planning to draw on its portfolio of some 300 patents to launch a series of products for consumer applications. The new funding will allow the company to market an innovative component needed for the development of USB-C plugs that are compatible with the recently approved USB4 specification.
http://swissinnovation.org/news/web/2019/11-190923-63

12. General Interest

Over 75% of Swiss People are Physically Active

(The Federal Council, August 30, 2019)

The most recent health survey of Switzerland, the Swiss Health Survey 2017 was recently published. It shows that three quarter of the Swiss citizens engage in sufficient physical activity. There has been a continued trend towards higher physical activity with 76% of population taking sufficient exercise and only 9% were considered inactive. Active people also tend to have a healthier lifestyle in general. The study showed that there were links between physical activity and mental health and dealing with stress. Even though, sport does not offer protection against stress at work, it can help to deal with it better.
http://swissinnovation.org/news/web/2019/12-190830-ca

Communication of Birds

(University of Zurich, September 09, 2019)

A core attribute of human language is that stringing together meaningless sounds creates meaningful signals which another person understands. An international research team under the lead of the University of Zurich have for the first time managed to shed light on animal vocalization and that it is also built from smaller building blocks. By analyzing the calls of the Australian chestnut-crowned babbler the team identified building blocks a non-human communication system. By using playback experiments, the scientists confirmed that the bird's call could be broken up into two perceptually distinct sounds that are shared across the calls in different arrangements. The researchers emphasize that a focus on the acoustic

distinctiveness of sounds in meaningful animal vocalizations offers a promising approach to investigate the building blocks of non-human animal communication systems.
http://swissinnovation.org/news/web/2019/12-190909-4d

13. Calls for Grants/Awards

Call for Swiss Startups for CES ASIA 2020

(swissnex China, July 31, 2019)

swissnex China is looking for Swiss startups to join CES ASIA 2020! At CES ASIA 2019, swissnex China had the largest country pavilion and brought 22 top Swiss DeepTech startups. The startups had the chance to showcase their excellence during three days in the #SWISSTECH Pavilion, got a chance to meet Swiss Ambassador to China Bernardino Regazzoni, and Gary Shapiro, CES's president and CEO. Additionally, a separate pitching night with 180 investors and industry experts allowed the startups to facilitate cooperation and partnerships. The CES ASIA 2020 pavilion is already booked and swissnex China is looking for Swiss DeepTech startups interested in coming to Shanghai, China, next year. Please sign up under the following link until January 31, 2020: https://is.gd/SvfeSS
http://swissinnovation.org/newshttp://swissinnovation.org/news/web/2019/13-190731-65

Call: Young Scientists Mobility Grants with MENA Countries

(University of Applied Sciences Western Switzerland, January 03, 2019)

The State Secretariat for Education, Research and Innovation (SERI) has commissioned the HES-SO as Leading House for the Middle East and North Africa (MENA) region. The following countries have been identified as priority countries for the first phase: Egypt, Lebanon, Morocco, Palestine, Qatar, Tunisia and the United Arab Emirates. The mobility grants can be awarded to young scientists who hold a bachelor's or master's degree but no PhD yet, and with not more than 6 years of professional research experience. The call is open for activities in all scientific disciplines and fields of research. Activities may include field work and/or an internship in relation to the applicant's research project. The applicant's mobility visit should have a minimum duration of 4 weeks and the amount not more than CHF 5,000 per grant. Applications will be accepted until December 31, 2019.
http://swissinnovation.org/newshttp://swissinnovation.org/news/web/2019/13-190103-8c

Call: Team-Oriented Cross-Border Research

(Swiss National Science Foundation, May 12, 2019)

SPIRIT facilitates knowledge exchange between Swiss researchers and researchers in selected partner countries of low and middle income. Funding is awarded to research projects with clearly defined goals that are submitted by excellent research consortia from two to four countries. Researchers from all disciplines can apply for a SPIRIT grant; the topics are chosen by the researchers themselves. The grants contribute to the education of researchers in all participating countries. Special focus is given to equal opportunities and the promotion of women scientists, as well as to raising awareness of gender-specific questions. The submission deadline is December 31, 2019.
http://swissinnovation.org/newshttp://swissinnovation.org/news/web/2019/13-190512-86

Call: Young Talents in Clinical Research

(Swiss Academy of Medical Sciences, July 03, 2019)

The SNSF is launching a call for targeted funding of investigator-initiated clinical studies that are outside the industry focus. The special programme for Investigator Initiated Clinical Trials (IICTs) of the Swiss National Science Foundation supports clinical studies on documented but under-researched medical needs. Though important for patients, these study topics remain outside the industry focus. The IICT programme does not provide support for non-randomized and uncontrolled studies. The deadline for submitting proposals on mySNF is November 01, 2019 at 17:00 Swiss local time. The SNSF recommends drawing up the study protocol with help from local clinical trial units.
http://swissinnovation.org/newshttp://swissinnovation.org/news/web/2019/13-190703-7d

Call: PRIMA Program for Excellent Women Researchers

(EPFL, July 30, 2019)

The EPFL School of Life Sciences wishes to host and support candidates applying for the PRIMA program for excellent women researchers. The application is open to researchers working in any area of the life sciences, but quantitative and computational biology are particularly encouraged. PRIMA grants are aimed at excellent women researchers who show a high potential for obtaining a professorship. PRIMA grants cover the PI's salary as well as project funds for a five-year period (www.snf.ch/en/funding/ careers/prima/Pages/default.aspx). The application deadline is November 1, 2019.
http://swissinnovation.org/newshttp://swissinnovation.org/news/web/2019/13-190730-f1

Call: SNSF Eccellenza Professorial Fellowship

(EPFL, July 31, 2019)

The EPFL School of Life Sciences wishes to host and support candidates applying for a SNSF Eccellenza Professorial Fellowship. The SNSF Eccellenza Professorial Fellowships are aimed at researchers who have a doctorate or equivalent qualification pursuing an academic career. The grant covers the PI's salary as well as project funds for a five-year period (http://www.snf.ch/en/funding/careers/ eccellenza). The deadline for this fellowship program is February 1, 2020.
http://swissinnovation.org/newshttp://swissinnovation.org/news/web/2019/13-190731-57

Upcoming Science and Technology Related Event

Sustainable Fintechs
October 16, 2019
https://is.gd/KUvLZf
FinTech, Sustainability
Bern

Uber: Future of Mobility
October 22, 2019
https://is.gd/EfG26t
Mobility, Ride Hailing
Olten

Pharma and Medtech innovation
October 24, 2019
https://is.gd/yZwuVA
Energy Sources, Society 2.0
Basel

Life Sciences Event
November 5, 2019
https://is.gd/rqLQJi
Medicine, Health
Ecublens VD

Urban Blockchain Summit
November 19, 2019
https://is.gd/cOYz4O
Smart Cities, Technology
Bern

Trusted AI
October 22, 2019
https://is.gd/Tx8dOY
Artificial Intelligence
Zurich

Digital Transformation in Life Science
October 23, 2019
https://is.gd/ChlyaE
Health, MedTech
Zurich

Geneva Peace Week 2019
November 4, 2019
https://is.gd/n5QhjG
Political Inclusion, Conflict Mitigation
Geneva

2nd Intl. FinTech, InsurTech and Blockchain Forum
November 5, 2019
https://is.gd/RwRRa1
Zurich

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