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Science-Switzerland, October – November 2017

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Jacques Dubochet Wins 2017 Nobel Prize in Chemistry

(SWI, October 04, 2017)

Jacques Dubochet of University of Lausanne has been awarded this year's Nobel Prize in Chemistry together with two other scientists from Britain and the United States for developing the method of cryo-electron microscopy. Dubochet's key contribution to the cryo-electron microscopy was to cool "water so rapidly that it solidified in its liquid form around a biological sample, allowing the biomolecules to retain their natural shape even in a vacuum", the Royal Swedish Academy of Sciences said. Simply freezing the samples so that water turned to ice was not a solution, as Dubochet himself pointed out, speaking of the impetus for his project. "Everything that would normally float in the water would be ruined." The award is worth CHF 1 million.
http://swissinnovation.org/news/web/2017/00-171004-45

1. Policy

Exchange and Mobility Strategy for More Young People

(admin.ch, November 02, 2017)

The Confederation and the Cantons have expressed the aim for more young people to take part in exchange and mobility activities at home or abroad at least once during their training or transition to working life which will be beneficial for their language skills as well as for their professional and social skills. To achieve this the cantons and the confederation have now adopted the exchange and mobility strategy. It involves expansion of the existing exchange and mobility programmes and further development of them. At the same time, steps will be taken to improve access to information and programmes. Finally, the exchange and mobility strategy establishes the preconditions needed for effective cooperation and coordination between the Confederation and the cantons as well as with other exchange and mobility actors.
http://swissinnovation.org/news/web/2017/01-171102-58

Switzerland and India Research Collaboration

(admin.ch, November 23, 2017)

The fourth Switzerland - India Joint Committee Meeting on 21 November 2017 set the course for future bilateral cooperation in the field of research. The aim of the meeting in New Delhi was, on the one hand, to evaluate the latest cooperation and processes. On the other hand, the delegations defined the next phase of the bilateral programme. The discussions resulted in an agreement that the Indian Department for Biotechnology (DBT) and the SNSF would launch a joint call for projects at the beginning of 2018. The "Academia Industry Training Programme", which was opened by swissnex India for the fourth time on the sidelines of the meeting, was considered as a particularly successful collaboration. The next meeting of the Joint Scientific Committee is scheduled to take place in Switzerland in 2019.
http://swissinnovation.org/news/web/2017/01-171123-74

2. Education

"ETH plus" to Boost Cutting-Edge Research

(ETH Zurich, November 12, 2017)

"ETH plus" was a key theme throughout the ETH Faculty Retreat held on 10-11 November in Lucerne. The goal of "ETH plus" is to establish many new professorships for more cutting-edge disciplines, so as to create fresh research and teaching opportunities. To finance this new expansion phase, the Executive Board plans to use the funds that the entire university has saved through prudent long-term financial planning. Thereafter a model should be developed proposing a modest reduction in the basic funding of professorships and creating incentives to attract more third-party funds. Building on the outcome of the Lucerne Retreat, the Executive Board will shortly propose an action plan involving all the university's teaching staff and consultative bodies.
http://swissinnovation.org/news/web/2017/02-171112-75

EPFL Extension School Opened

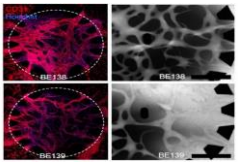
(EPFL, November 15, 2017)

The EPFL Extension School offers online courses with no prerequisites, enabling participants to obtain a Certificate of Open Studies from EPFL. Enrollment for the first program opened recently. The EPFL Extension School is particularly well suited to professionals looking to study in an innovative field without having to give up their day job. It offers courses on concrete topics that are directly linked to the job market. "The only way to be ready for the digital transformation is to be part of it, which requires practical digital skills," says professor Marcel Salathé, the school's academic director. "The EPFL Extension School is our response to that challenge - online, flexible, affordable, and cutting-edge."
http://swissinnovation.org/news/web/2017/02-171115-d4

3. Life Sciences / Health Care

Possible New Immune Therapy Target in Lung Cancer

(UNIBE, October 18, 2017)



Lung cancer accounts for the highest number of cancer-related deaths, with an estimated 1.6 million deaths in 2012 worldwide. Among different types of lung cancer, non-small cell lung cancer (NSCLC) is the most prevalent. A research team from the University of Bern found that perivascular cells play an important role in tumor progression. They found that in comparison with the same cell type isolated from normal lung tissue, perivascular cells from NSCLC lesions showed several abnormalities. They not only inadequately support vascular structures, but also may actively modulate the inflammatory and immune response. These findings may represent a novel stromal cancer target but further studies are needed to verify the results.
http://swissinnovation.org/news/web/2017/03-171018-d1

Teeth Growing on the Body

(UNIGE, October 18, 2017)

In most vertebrates, teeth develop only in the mouth. However, the so-called denticulate catfish, a rare exception, has reinvented body dentition during evolution and regularly grows teeth on the outside of the body. Those special teeth are used for defense and also play a role in mating. Researchers from the University of Geneva have studied the fish's recovery capacity and found that the extra-oral teeth always grow on a bone, even in the absence of a bony plate. By reconstructing the evolutionary history of catfish they found that this particular species appeared around 120 million years ago, long before the emergence of bony plates. These results help to elucidate the mechanisms allowing the formation and regeneration of teeth in all vertebrates, including in humans.
http://swissinnovation.org/news/web/2017/03-171018-0c

Horizon 2020 Funding to End to Cyanide Poisoning

(startupticker.ch, October 23, 2017)

Horizon 2020 funds high-potential innovation through a dedicated SME instrument, which offers seamless business innovation support under the section Societal Challenges. CyanoGuard, a Zurich based startup developing solutions for detecting toxic substances in water, food extracts and blood samples, has now been selected for funding under Phase 1 of Horizon 2020's SME Instrument. CyanoGuard will use the funds to study how its CyanoKit tackles societal challenges related to climate change, environment, resource efficiency and raw materials, with close attention to food and water safety. "This award is a game changer for our company" said Benedikt Kirchgässler, founder of Cyanoguard, "To be recognized by the European Union as an innovative player in our continent's food and water safety is a huge achievement for us[...]."
http://swissinnovation.org/news/web/2017/03-171023-45

New Scale Weighs a Single Cell

(ETH Zurich, October 26, 2017)

A living cell's mass is a good indicator of its physiology, but until recently it has been impossible to measure the weight of cells, which is usually two to three nanograms. In collaboration with the University of Basel and University College London, ETH scientists have developed a highly sensitive scale. It not only measures a cell's weight but monitors the change in weight over time, for example during cell division, with a resolution of milliseconds and trillionths of a gram. For the measurement, the cell hangs on the underside of a tiny cantilever. This is induced to oscillate by a laser at its fixed end. Another laser measures the oscillations at the other end where the cell hangs – first without, then with the cell. The difference between the oscillations gives away the cell's exact weight. The new scale will be produced soon by the Swiss company Nanosurf AG.
http://swissinnovation.org/news/web/2017/03-171026-52

Bacterium's Sense of Touch

(UNIBAS, October 26, 2017)

Bacteria not only respond to chemical signals, but also possess a sense of touch. A research group from the University of Basel has discovered that bacteria recognize surfaces and respond to this mechanical stimulus without having sensory organs in the classical sense. The reaction of bacteria to mechanical stimuli has long been uncertain. But by studying a bacteria living in liquids, the group discovered that the bacteria's rotor, the so-called flagellum, also serves as a sensing organ. When reaching a surface, the bacterial cell boosts the synthesis of a messenger, which stimulates the production of an adhesin that anchors the

bacteria within a few seconds. Some pathogens use mechanical stimulation as a trigger to damage host tissue, thus understanding those mechanisms could help preventing infections.
http://swissinnovation.org/news/web/2017/03-171026-30

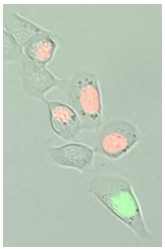
New Weapon Against Malaria

(UNIGE, October 26, 2017)

Malaria kills more than 500'000 people per year, about 80% of which are under the age of five. People living in endemic areas usually develop a natural immunity. This means that when they are infected with the parasite, they only suffer from mild symptoms. But when bitten again, they can transmit the parasite to the mosquito, allowing the disease to spread further. To eradicate malaria it is therefore necessary to interrupt the transmission from an infected human to the mosquito. By identifying two proteases, or molecular scissors, used by the parasite to enter and exit host cells, researchers at the Universities of Geneva and Bern could find a possible inhibitor molecule. It simultaneously blocks both proteases, and therefore promises a new type of drugs that inhibits the human-to-mosquito transmission of the disease.
http://swissinnovation.org/news/web/2017/03-171026-4e

Enhancing Cancer Treatment by Destroying "Sleeper Cells"

(UNIBE, October 26, 2017)



For some cancer patients, chemotherapy can be extremely effective, even when their tumor has metastasized, i.e. it has settled in remote tissue. The cancer may even disappear. But then comes the disillusioning news: a few cancer cells have survived and are multiplying again. Sometimes they respond to renewed treatment, but then develop resistance against all therapeutic methods. As a research team led by the University of Bern has discovered, this is because some isolated cancer cells survive chemotherapy by becoming dormant. Once the therapy has ended, they start to multiply again. If, however, these sleeper cells possess specific defects, they can be destroyed using anti-cancer drugs. The findings, published in Clinical Cancer Research, indicate how the efficacy of chemotherapy could be increased for certain patients.
http://swissinnovation.org/news/web/2017/03-171026-b6

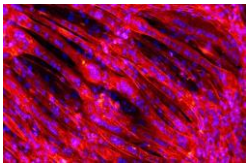
Illuminated Pajamas for the Treatment of Newborns

(EMPA, October 31, 2017)

Alone, naked, and with their eyes covered for protection: this is how newborns lie in incubators when they are being treated for jaundice. Irradiation with blue light in an incubator is necessary because toxic decomposition products of the blood pigment hemoglobin are deposited in the skin in newborns with jaundice. Researchers of EMPA have now significantly improved the not-so-child-friendly procedure by combining the treatment with the needs of the newborns: The team, led by Luciano Boesel, developed illuminated pajamas for babies that turn the treatment into a wellness experience. To do this, the material researchers created textiles with optically conductive fibers woven into them. Battery-operated LEDs serve as a light source for the light-conducting threads. The researchers are now working on increasing the light intensity of the LEDs.
http://swissinnovation.org/news/web/2017/03-171031-84

Spraying Process to Grow Muscle Fibers

(EMPA, November 07, 2017)

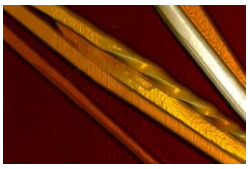


An artificial heart would be an absolute lifesaver for people with cardiac failure. However, to recreate the complex organ in the laboratory, one would first need to work out how to grow multi-layered, living tissues. Researchers at EMPA have now come one step closer to this goal: by means of a spraying process, they have created

functioning muscle fibers. They did so by letting cells develop into muscle fibers in a three-dimensional synthetic polymer scaffold. To protect the muscle cells during the injection into the scaffold, the researchers at EMPA have packaged them in protective capsules which dissolve after injection. In the future the aim is to grow muscle fibers on an artificial heart with the muscle cells from the patient itself and so avoid rejection.
http://swissinnovation.org/news/web/2017/03-171107-e1

Amyloid Fibrils Form Crystals

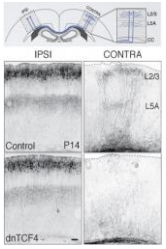
(ETH Zurich, November 07, 2017)



Amyloid fibrils are infamous for the role they play in serious neurological diseases in humans, such as Parkinson's. One trigger for Alzheimer's disease is the misfolding and aggregation of proteins such as tau and ABeta. This causes the formation of tiny fibrils that then accumulate in the brain. Specialists refer to these fibres as amyloid fibrils. An international team of researchers have now discovered a new type of transition in protein folding: amyloid crystals formed from amyloid fibrils by a decrease in energy. "Our results shed new light on the self-organization of proteins that have a tendency to form amyloids, and on the most stable status of proteins in general, says Raffaele Mezzenga from ETH, "our discovery means that the energy landscape of protein folding must now be revisited."
http://swissinnovation.org/news/web/2017/03-171107-ae

Late Neurons Can Cause Behavioural Disorders

(UNIGE, November 07, 2017)



During the fetal stage, millions of neurons are born in the walls of the ventricles of the brain before migrating to their final location in the cerebral cortex. If this migration is disrupted, the new-born baby may suffer serious consequences. What happens, however, if the migration takes place but is delayed? Researchers at the University of Geneva (UNIGE), have discovered that even a slight delay may lead to behavioral disorders. They also found that these disorders are due to the abnormally low activity of the late neurons, which leads to permanent deficit of interneuronal connections. The scientists succeeded in correcting the activity of the relevant neurons, thereby preventing the appearance of behavioral disorders. The results will open up new avenues for preventing neurodevelopmental disorders linked to the cerebral cortex.
http://swissinnovation.org/news/web/2017/03-171107-d1

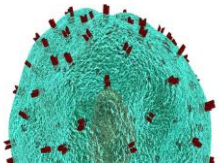
Lymphatic System Helps Flushing the Brain

(ETH Zurich, November 10, 2017)

ETH researchers have made a far-reaching finding concerning the physiology of the brain. Every day, the body produces about half a liter of new cerebrospinal fluid, which flushes the brain, removes unwanted substances, and exits the cranial cavity again. But it does not leave it via blood vessels, but instead through the lymphatic system. This was proven by injecting fluorescent molecules into the brains of mice. The scientists then observed how these molecules, using a non-invasive imaging technique to examine the blood and lymphatic vessels. They found that the dye molecules appeared in the lymphatic vessels and lymph nodes outside the brain just a few minutes later. They could also show that much less fluid leaves the brain in older mice than in younger ones, presumably because less fluid is produced in old age. With this insight, it could be examined whether inflammatory diseases of the central nervous system could be managed by regulating the lymphatic flow.
http://swissinnovation.org/news/web/2017/03-171110-6b

Engineered Non-Immune Cells to Kill Cancer Cells

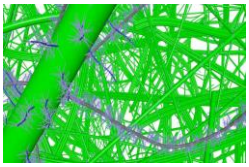
(ETH Zurich, November 13, 2017)



T-cells are one of the immune system's major weapons. They detect the body's cells infected with a virus and trigger their ablation, effectively killing the virus. T-cells cannot do the same with cancer cells, however, as they do not recognize them as foreign cells and are therefore unable to eliminate them. ETH researchers have now built three additional components into human renal cells and (adipose) stem cells, thereby transforming them into synthetic designer cells that mimic T-cells and are capable of detecting and destroying cancer cells. So far, ETH researchers have only tested their new cells in cell cultures. They are working now on possible clinical test scenarios for the newly designed cells.
http://swissinnovation.org/news/web/2017/03-171113-5e

Soft Biological Tissue Loses Mass as It Is Squeezed

(ETH Zurich, November 20, 2017)



By looking at different medical conditions involving the tearing of tissue, engineers at ETH Zurich have discovered that soft biological tissue deforms very differently under tension than previously assumed. One of their most important – and surprising – findings is that tissue loses mass as it stretches, with a physiological stretch of 10 per cent leading to an average loss of about 50 per cent. They found that this effect is due to the squeezing of collagen fibrils which squeeze the liquid out of the tissue. Based on their new findings, the researchers now want to look at the substrates on which the tissue grows. "Our aim is to create the most physiologically accurate conditions for the engineered tissue" says Professor Edoardo Mazza from ETH Zurich.
http://swissinnovation.org/news/web/2017/03-171120-96

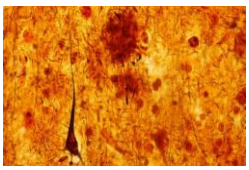
Immune System Can Regulate Insulin Production

(UNIBAS, November 21, 2017)

Inflammation processes are responsible for the failure of insulin production in diabetes patients. Researchers at the University of Basel and University Hospital Basel have now found a feedback mechanism that could help maintain insulin production in overweight sufferers. They found that the protein IL33 in the pancreas stimulates the ILC2 cells, which trigger the release of insulin in overweight individuals using retinoic acid and could therefore be used to inhibit the failure of insulin production. Similar findings are already in use in clinical applications.
http://swissinnovation.org/news/web/2017/03-171121-94

Tau Protein Forms Toxic Complexes With Cell Membranes

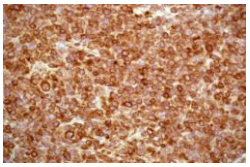
(EPFL, November 22, 2017)



The brains of patients with Alzheimer's disease contain characteristic tangles inside neurons. These tangles are formed when a protein called Tau aggregates into twisted fibrils. As a result, the neurons' transport systems disintegrate, essential nutrients can't move through, and the cells begin to die, affecting the brain's functions and giving rise to the disease's symptoms. Scientists at EPFL have discovered a new toxic form of Tau that forms as a result of its interaction with cell membranes. This interaction gives rise to highly stable complexes made up of several Tau proteins as well as fat molecules (phospholipids) from the membrane. This process can induce toxicity in primary neurons. The researchers are now continuing to study this effect to get a clearer understanding.
http://swissinnovation.org/news/web/2017/03-171122-70

New Molecule Inhibits the Growth of Lymphoma Cells

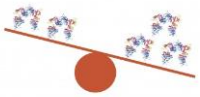
(USI, November 28, 2017)



Cancer cells are able to elude physiological control and grow in uncontrolled manner. In fact, groups of "pro-tumor" proteins can get activated and no longer respond to the normal intracellular “anti-tumor” control mechanisms. Among the “pro-tumor” proteins, the network including the signal molecules “PI3K/AKT/mTOR” is well known to sustain the survival and proliferation of cancer cells. Importantly, the PI3K/AKT/mTOR signaling axis is active in lymphomas and blocking could represent a good strategy to fight lymphoma cells. Researchers from USI have now managed to achieve this by using the molecule PQR309 (bimiralisib). The results of this study, together with the ongoing clinical studies with PQR309, can lead to better treatments for people affected with lymphoma and to better understanding of the mechanisms of action of anti-lymphoma agents.
http://swissinnovation.org/news/web/2017/03-171128-10

Discovery of Trisomy 21 Symptoms

(UNIGE, November 28, 2017)



Researchers at the University of Geneva and ETH Zurich have discovered that the symptoms of trisomy 21 are based on dysregulation of cellular functions caused by an overdose of mRNA and proteins. The cells of an affected individual are overwhelmed by the protein surplus generated by the triplicated genes. Also, not only genes located on the triplicated chromosome are affected, but proteins encoded by genes on other chromosomes are dysregulated too. In some cases, the problem is the existence of too little proteins. Particularly in mitochondria, which are responsible for energy processes in cells, the geneticists found an effect of trisomy 21. These discoveries were made with a new mass spectrometry technique developed at ETH. It allowed the analysis of the proteins of twins who share the same genetic background, one having trisomy 21 and the other not.
http://swissinnovation.org/news/web/2017/03-171128-32

Big Data Tool for Personalized Medicine

(EPFL, November 29, 2017)

Most complex diseases, such as obesity, longevity, and diabetes, are largely influenced by genetic factors. But at the same time, they are also modulated by environmental stimuli, such as diet and physical activity. This interaction between the environment and genetic makeup makes every human unique, and underpins the need for personalized medicine. Researchers from EPFL have now developed a novel series of systems genetics tools to identify new links between genes and phenotypes. They achieved this by collecting over 300 million phenotype datapoints from mice and organizing it in a cloud-based data warehouse. The toolkit is already online at systems-genetics.org and is expected to significantly facilitate the discovery of gene-phenotype and gene-gene links.
http://swissinnovation.org/news/web/2017/03-171129-9a

Pneumonia Treatment with Vaccines

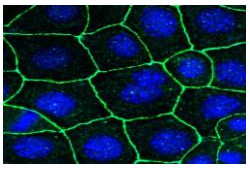
(UZH, November 30, 2017)

Mycoplasma bacteria are one of the most common causes of bacterial pneumonia in children. It is still unclear how the disease develops. Researchers from the University Children's Hospital Zurich and UZH have now demonstrated that there are specific immune cells, so-called B cells, which are crucial for recovery from the infection. By culturing bacteria with a fluorescent dye, they showed that the antibodies produced by B cells eliminate mycoplasma in the lungs, whereas these bacteria can persist in the upper respiratory tract. “Our work paves the way for the development of vaccines against mycoplasma. Target groups for such

vaccines would include young children without treatment alternatives as a result of the emerging resistance to antibiotics against mycoplasma in certain countries," says Meyer Sauteur from UZH.
http://swissinnovation.org/news/web/2017/03-171130-0c

Mechanical Stretch Influences Proliferation of Cancer

(UNIGE, November 30, 2017)



The epithelium, a tissue made up of closely juxtaposed cells, forms the glands and covers the outer surface of the human body as well as its internal cavities. These tissues are subjected to multiple types of mechanical stretch, such as those caused by passing food or filling a bladder. The mechanical input strongly influences the proliferation and differentiation of epithelial cells, whether healthy or cancerous. Researchers at the University of Geneva have now discovered that the proteins Zonula Occludens-1 and -2 (ZO-1 and ZO-2), which contribute to the tightness of the epithelium, perceive these physical signals and activate different cellular responses accordingly. ZO-1 and ZO-2 are also likely to play a role in the proliferation of cancer cells, which are sensitive to mechanical forces in their environment.
http://swissinnovation.org/news/web/2017/03-171130-f9

4. Nano / Micro Technology / Material Science

Tissue Glue Based on Nanoparticles

(EMPA, October 09, 2017)

In spite of medical advances, wound-related complications arising after operations can still be life-threatening. In order to avoid post-operative wound complications, a new nanoparticle-based tissue glue has been developed by researchers at EMPA. It can help to close wounds optimally in areas where they are difficult to locate or access by sticking instead of stitching and to avoid diffuse and often life-threatening hemorrhages. By using nanoparticles made from a combination of different materials, they could achieve significantly better results than with the currently used Fibrin and even make the glue bioactive. Thanks to this success, the researchers are still pursuing research on their tissue glue and also looking for other possible applications.
http://swissinnovation.org/news/web/2017/04-171009-90

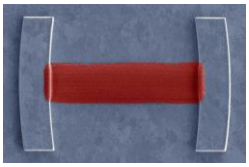
PSI Neutron Beams to Unravel the Secrets of Metal Artifacts

(PSI, October 10, 2017)

Neutron beams reveal what lies inside metal objects without destroying them. That's because the neutrons penetrate materials where any X ray beam - the classic means for nondestructive testing - will fail. The Paul Scherrer Institute (PSI) has now undergone a collaboration with archaeologists to help them not only to see what is hidden in hollow spaces of metal artifacts but also to gain insights into how such ancient artefacts were made and how they can be preserved for posterity. With PSI's neutron source SINQ researchers could unravel the secrets of several old artifacts. "That is really a rare and fascinating collaboration between natural science and cultural scholarship", says Michael Hens, one of the archaeologists collaborating with PSI.
http://swissinnovation.org/news/web/2017/04-171010-50

Surface Plasmon Laser

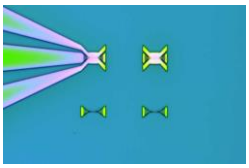
(ETH Zurich, October 16, 2017)



When light is confined between two partially reflecting mirrors and amplified by some material in between them, the resulting beam can be extremely bright and of a single color. Researchers at ETH Zurich have now developed a miniature device that applies the same principle to so-called surface plasmons, a particular kind of electromagnetic wave, by using tiny silver blocks as laser cavity equivalent with inserted quantum dots as amplifiers. The electromagnetic waves created by such a surface plasmon laser, or "spaser", can be focused much more tightly than light. The new approach has several advantages compared to previous attempts at realizing spasers like the possibility of extracting the laser beam as well as more freedom of choice regarding the size and geometry of the cavity.
http://swissinnovation.org/news/web/2017/04-171016-8e

Optoelectronics without Glass

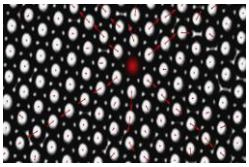
(ETH Zurich, November 03, 2017)



Optical components for microelectronics must be made of glass. Metals are not suitable for this purpose, since optical data can propagate only across roughly a distance of 100 micrometres. This was the general view of scientists until recently. A team of researchers headed by Juerg Leuthold, professor in the Department of Information Technology and Electrical Engineering, has now succeeded in doing what was thought to be impossible and developed a light-processing component made of metal. They accomplished this feat by building a small enough component, a modulator: at just 3 x 36 micrometres, it is within a size range in which both optical and electrical information can propagate in metals. This tiny modulator could be used one day to connect the individual chips in computers.
http://swissinnovation.org/news/web/2017/04-171103-7e

Liquid shock absorbers

(Swiss National Science Foundation, November 08, 2017)



At first glance, colloids resemble homogeneous liquids such as milk or blood plasma. But in fact they consist of particles in suspension. Some colloids have remarkable properties: they may stiffen following an impact and absorb surface shocks. This property is of interest for many applications, from bulletproof vests to protective shields for satellites. Researchers funded by the SNSF have now determined how colloids stiffen in response to powerful impacts. They found that the micrometer-sized particles only have an effect for very intense impacts such as the impact of a bullet or of a micro meteorite. The researchers observed that under these conditions the properties of the particles play a crucial role for the behavior of the colloid.
http://swissinnovation.org/news/web/2017/04-171108-d4

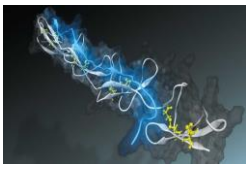
Stacked Color Sensor

(EMPA, November 16, 2017)

Image sensors, for example in mobile phone cameras, work in a way that blue, green and red sensors alternate in a mosaic-like pattern and intelligent software algorithms calculate a high-resolution color image from the individual color pixels. However, the principle also has some inherent limitations: as each individual pixel can only absorb a small part of the light spectrum that hits it, a large part of the light is lost. EMPA researchers have now succeeded in developing a prototype of a stacked sensor that circumvents these problems. It consists of three different types of stacked perovskites which each absorb only part of the light spectrum. The researchers are now working on industrialization and miniaturization of their prototype.
http://swissinnovation.org/news/web/2017/04-171116-06

Measuring Tension of Tissue Fibers

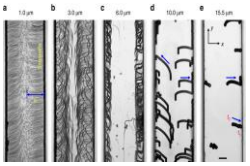
(ETH Zurich, November 27, 2017)



Bacteria are able to attach themselves to tissue fibers with the aid of a 'nano-adhesive'. This nano-adhesive is a peptide thread with several binding sites strung together like pearls wich adheres to what are called fibronectin fibers. ETH researchers have now found that these peptides only bind to un-tensioned fibronectin tissue. By creating bacterial peptide and doing different tests in collaboration with the Paul Scherrer Institute, they found that these tensioned fibers are mainly present in tumor tissue. The scientists hope now that the peptides will be able to serve as diagnostic markers of tumor tissues and of other degenerative diseases. The peptides could be used for radiation therapy or for delivering active pharmaceutical ingredients to the diseased site.
http://swissinnovation.org/news/web/2017/04-171127-c8

Rolling Micro Particles

(ETH Zurich, November 28, 2017)



When white blood cells are summoned to combat invasive bacteria, they move along blood vessels in a specific fashion, i.e., like a ball propelled by the wind, they roll along the vascular wall to reach their point of deployment. Inspired by this method, scientists at ETH Zurich have now succeeded in getting particles to move along the walls of microscopic, three-dimensional vessels. They achieved this by putting magnetic particles into an artificial vasculature. When a rotating magnetic field is applied, these particles self-assemble into aggregates and start to spin around their own axes. When the researchers apply ultrasound at a specific frequency and pressure, the aggregates migrate towards the wall and start rolling along the boundaries. In a next step the researchers will test their particles under flow conditions.
http://swissinnovation.org/news/web/2017/04-171128-9b

Nanotransistor Made of Graphene

(EMPA, November 29, 2017)

Transistors made of graphene ribbons are a promising technology. The smallest details in the atomic structure of these graphene bands, however, have massive effects on the size of the energy gap and thus on how well-suited nanoribbons are as components of transistors. A major role for this plays the structure of the edges, while bands with a zigzag edge behave like metals, i.e. they are conductive, they become semiconductors with the armchair edge. EMPA researchers have now succeeded in growing ribbons exactly nine atoms wide with a regular armchair edge from precursor molecules. The specially prepared molecules are evaporated in an ultra-high vacuum for this purpose. The researchers are now working on a better alignment of the nanoribbons to reduce the level of non-functioning transistors.
http://swissinnovation.org/news/web/2017/04-171129-15

5. Information & Communications Technology

More Efficient Video Streaming Thanks to Machine Learning

(EPFL, October 17, 2017)

With a growing number of users, uploaded videos and connected devices, the current streaming model is no longer viable. The storage space required for servers is constantly increasing, as is the energy consumption associated with these installations. Thanks to its work, the Embedded Systems Laboratory at EPFL has succeeded in

reducing these requirements in space and in energy, without altering the quality of the viewing. By using machine learning to analyse the streaming behavior of a video, they could reduce the power requirement by nearly 20% while improving the user experience by 37%. In a next step, the researchers try to use their method to make real time streaming feasible.
http://swissinnovation.org/news/web/2017/05-171017-b6

News Agencies Don't Translate Word for Word

(UNIGE, October 30, 2017)

In their desire to avoid literal translations and facilitate the public's understanding, journalists tend to neglect the transmission of opinions of people speaking in a foreign language, preferring familiar referents in the same language as that of the target readership. A University of Geneva (UNIGE) study has now examined how news agencies translate and rewrite material, highlighting the risks inherent in the process, including the notion of cultural confinement. "The research showed that the cultural references used and the way they are presented are different for each language, even though the subject is the same," notes Lucile Davier from UNIGE. Only direct quotes are translated word for word. "It's no longer a matter of seeing translation as an operation that takes place between words but between cultures," argues Davier in conclusion.
http://swissinnovation.org/news/web/2017/05-171030-34

Smart Floors

(EPFL, November 06, 2017)

Our floors will soon be able to track exactly where we go and how we walk. A new technology developed by the EPFL spin-off Technis connects everyday flooring with artificial intelligence and can collect and transmit data in real time. Initially designed for connected sports surfaces it can now be used in shopping malls, hospitals or event venues. Unlike a camera, it's non-intrusive, meaning it can readily be used in clinics or nursing homes. The system's algorithm recognizes different ways of walking, objects with wheels and knows when a person falls. Technis has already won over 10 innovation awards and grants and could commercialize its technology at several event venues.
http://swissinnovation.org/news/web/2017/05-171106-f5

Mobile Communication for Everybody

(EPFL, November 27, 2017)

Many people still live without telecom infrastructure or reliable Internet connection. In order to change this, EPFL researchers - together with the Pennsylvania State University and Médecins Sans Frontières - have developed an instant messaging system for camps, as well as a reliable, fast, and portable system for the communication between an NGO headquarter and its field workers. The heart of the system is the inexpensive computer Raspberry Pi. The team programmed it to work like a local server, allowing anyone within a certain range to access a web-based messaging service independent of telephone and Internet service providers. The server is running on battery power and the data is stored locally so that it can't be accessed from the outside or be used inappropriately.
http://swissinnovation.org/news/web/2017/05-171127-9d

6. Energy / Environment

Mercury is Dangerous Even for Microalgae

(UNIGE, August 15, 2017)

The mercury found at very low concentrations in water is concentrated along the entire food chain, from algae via zooplankton to small fish and on to the largest fish — the ones we eat. Mercury causes severe and irreversible neurological disorders in people who have consumed highly contaminated fish. However it was still unknown what effects mercury has on the elements further down the food chain such as microalgea, which are the gateway for mercury. By studying the green microalgea Chlamydomonas reinhardtii a team from the University of Geneva (UNIGE) explored this question. They came to a clear conclusion: Mercury disrupted the metabolism of algae, with numerous genes being deregulated, even at concentrations comparable to those set by European environmental standards.
http://swissinnovation.org/news/web/2017/06-170815-ed

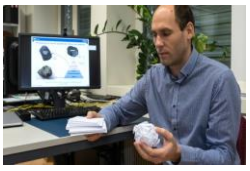
Microorganisms

(admin.ch, October 05, 2017)

A new study shows that bacteria are capable of mixing water layers in lakes. By accumulating locally they increase water density and thus the heavier water sinks and creates currents. An international research group led by EAWAG has now observed this bioconvection process for the first time in a natural water body. In Lake Cadagno in Ticino, bacteria form a thick layer at a depth of around 12 meters. They swim towards the light, but only as far as the water is mostly free of oxygen. The bacteria accumulating below this boundary increase the water density and initiate the mixing. As a result, temperature and salinity at a depth of 11–13 meters are found to be homogeneous, rather than steadily changing with depth as expected.
http://swissinnovation.org/news/web/2017/06-171005-a1

Battery from Waste Graphite and Scrap Metal

(EMPA, October 11, 2017)



Lithium ion batteries are flammable and the price of the raw material is rising. EMPA and ETH Zürich researchers have now discovered promising approaches as to how we might produce batteries out of waste graphite and scrap metal. The researchers turned the principle of the lithium ion battery upside down. In conventional Li-ion batteries, the anode (the negative pole) is made of graphite, the layers of which (in a charged state) contain the lithium ions. In the EMPA battery, on contrary, the graphite is used as a cathode (the positive pole). The thick anions are deposited in-between the graphene layers. In this battery, the anode is made of metal. For several months, a lab system survived thousands of charging and discharging cycles with these batteries. The researchers now want to further increase the energy density of the battery.
http://swissinnovation.org/news/web/2017/06-171011-19

Swiss Team Wins Solar Decathlon Competition

(EPFL, October 15, 2017)

The U.S. Department of Energy Solar Decathlon is a collegiate competition made up of 10 contests that challenge student teams to design and build full-size, solar-powered houses. The Swiss team shone at the 2017 Solar Decathlon with its solar house NeighborHub, winning the 1st general prize and many other awards. The 44 solar decathletes surpassed themselves on the competition site in Denver to build and show visitors around their solar community house. After more than two years of intense preparation, the Swiss team can be proud of the performance of its students.
http://swissinnovation.org/news/web/2017/06-171015-2c

Coevolving Species More Vulnerable to Extinction

(UZH, October 18, 2017)

Coevolution, the process in which interacting species evolve together, is greatly affected by how tightly the natural network is knitted. An international team with scientists from the University of Zurich found that coevolutionary processes also occur in complex communities of more than two species, and that the effects by indirect partners could outweigh the importance of one close, specialized partner. These results are based on a mathematical simulation of coevolutionary effects in 75 networks of mutually beneficial interactions. Environmental changes trigger evolutionary cascades of changes that keep propagating across the network, and the bigger the network is, the slower the adaptation to the change. The team concludes that rapid climate change likely increases extinction risks for many species, although they don't depend on one specific partner.
http://swissinnovation.org/news/web/2017/06-171018-9b

Sustainable Swiss Wood to Substitute Ebony

(EMPA, October 19, 2017)

Like many tropical wood types, ebony is endangered and features on the CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) list of protected wood species. Despite strict trade regulations, ebony stocks are plummeting and a substitute is urgently needed, especially for musical instrument manufacturing. EMPA spin-off Swiss Wood Solutions has discovered how to modify Swiss wood species so they exhibit the properties of endangered woods like ebony or grenadilla. Its "Swiss Ebony", an innovative product made of modified Swiss maple, exhibits hardness, good workability and excellent sound properties. However, in contrast to ebony, "Swiss Ebony" is a sustainable and entirely legal solution. This means musicians can travel with their top-quality instruments, without risk of prosecution or having their instruments impounded.
http://swissinnovation.org/news/web/2017/06-171019-ff

Mathematical Model to Predict Fish Parasite Outbreaks

(Eawag, October 23, 2017)

Freshwater fish are vulnerable to a parasite called Tetracapsuloides bryosalmonae. This parasite, which has no effect on humans, causes proliferative kidney disease (PKD) – which is highly contagious and can wipe out entire fish populations. Researchers from EPFL, Eawag and University of Bern have come up with a mathematical model for predicting outbreaks as part of a three-year joint research program. "We selected several stretches along the Wigger (a river in Switzerland) and in the watershed where we took fish samples, measured the concentration of both bryozoan and parasite DNA in the water, and calculated the hydrological and geomorphological variables," says Luca Carraro from EPFL's Laboratory of Ecohydrology. The model is now used by the Swiss Federal Veterinary Office.
http://swissinnovation.org/news/web/2017/06-171023-54

Adhesives and Composite Materials Made from Swiss Tree Bark

(SNF, October 24, 2017)

The bark of native conifers is known as a waste product in the timber industry. It is mostly burnt or used as garden mulch. A team from the National Research Programme "Resource Wood" has now developed a new process to extract valuable tannins from tree bark to produce adhesives and composite materials. Applying a two-stage water-based process, the researchers managed to extract tannins with an impressive level of purity. They then tackled the challenge of developing a recipe to

turn these extracts into adhesives for fibreboards and chipboards. "The application potential of wood bark tannins is great. Presently it is difficult to say in which direction the development will go," says Frédéric Pichelin from Bern University of Applied Sciences. "What is important is that Switzerland is not left behind."
http://swissinnovation.org/news/web/2017/06-171024-c4

Unifying Theory for Ecology

(EPFL, October 25, 2017)

Is there a link between a given species' body mass and its abundance, or between the size of an ecosystem and its level of biodiversity? Ecologists often find that similar relationships of this type (called scaling laws) exist in different ecosystems. But until now, no clear link has been drawn between these laws. In a recent study, EPFL researchers have now proved the existence of common macroecological patterns exhibited by these ostensibly independent scaling laws. These patterns could even lead to the discovery of a set of general laws governing the environmental sciences. "Our goal was to rationalize macroecological patterns observed in various ecosystems and position them in a unified framework from which they all derive," says Silvia Zaoli from EPFL.
http://swissinnovation.org/news/web/2017/06-171025-42

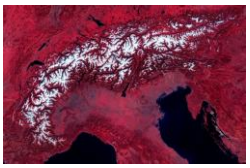
Improving How Ocean Temperature Change is Tracked

(EPFL, October 26, 2017)

A Franco-Swiss research team, including researchers from EPFL and the University of Lausanne, has discovered a flaw in the way past ocean temperatures have been estimated. Their findings, published in Nature Communications, imply that the current period of climate change is unparalleled. The established methodology shows that the temperature of the ocean depths 100 million years ago was around 15 degrees higher than current readings. However, the study's authors believe that the influence of certain processes was overlooked, especially those involving foraminifera – the fossils of tiny marine organisms found in sediment cores taken from the ocean floor. The researchers' computer simulations suggest that ocean temperatures may have remained relatively stable over the last 100 million years, which raises serious concerns about current levels of climate change.
http://swissinnovation.org/news/web/2017/06-171026-ce

First Mountain Trail Safety App

(startupticker.ch, October 26, 2017)



WeHike, a Lausanne based startup, announces the kick-off of DeFROST (Detailed and Fast Remote Observation of Snow for Tourism) project after confirming a grant from the European Space Agency (ESA) on the initiative. WeHike started working together with the University of Zürich, the Zurich-based startup ExoLabs and the Institute for Snow and Avalanche Research (SLF) in Davos to build a first prototype, which will make it possible to have an overview of the snow cover status over mountain trails and a prediction on whether a certain activity (e.g. hiking, biking or snowshoeing) is safe and feasible over a specific trail or not. The future system aims at using ESA's satellites to provide the data necessary.
http://swissinnovation.org/news/web/2017/06-171026-a6

Peat Bogs Can Withstand Climate Change

(EPFL, October 27, 2017)

Peat bogs play an essential role on our planet. While they cover only 3% of the earth's surface, they store some 500 metric gigatons of carbon. Because so much carbon is currently locked up in peat bogs, understanding how they respond to climate change is essential to know whether they might one day release massive amounts of CO2 into the air. A team from EPFL and other researchers found now that peat bogs

demonstrate a surprising ability to adapt to climatic variation. Despite their low biodiversity, they can effectively withstand both moderate and glacial climates. The data that the team collected from peat bogs across Europe will be used to carry out further research, such as comparative analyses of the bogs' microbial compositions and assessments of their resistance thresholds.
http://swissinnovation.org/news/web/2017/06-171027-3e

Songbirds Learn New Songs Step by Step

(ETH Zurich, November 01, 2017)

For a songbird, learning a new song is akin to a child learning a new language. As scientists from ETH Zurich and the University of Zurich have now shown, songbirds are minimalists when it comes to learning a new song. Zebra finches approach this challenge step by step, and even make a detour in the process – by taking song syllables that they already know and adapting them to the syllables that they have to learn. "The zebra finches have evolved the strategy of dividing a task as complex as learning a new song into easy-to-manage parts," says Richard Hahnloser from ETH. "This allows them to expand their repertoire with minimal effort. "The researchers assess now if infants use the same approach for learning languages.
http://swissinnovation.org/news/web/2017/06-171101-2b

Third Orangutan Species Discovered

(UZH, November 02, 2017)

Two species of Indonesian orangutans had previously been officially described and recognized – the Pongo abelii, living on the island of Sumatra, and the Pongo pygmeaeus, endemic to Borneo. In 1997, researchers at the Australian National University discovered an isolated population of orangutans in Batang Toru, a region within the three Tapanuli districts in North Sumatra. University of Zurich (UZH) anthropologists working together with an international research team have now established that these orangutans are actually a distinct third species, Pongo tapanuliensis. "It is very exciting to discover a new great ape species in the 21st century," Michael Krützen from UZH , although he cautions that the highest priority must now be to protect the Tapanuli orangutan. "All conservation efforts must focus on protecting the species' environment."
http://swissinnovation.org/news/web/2017/06-171102-65

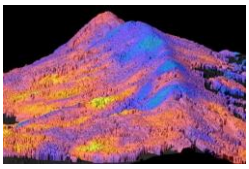
Statisticians Protect Marine Life

(UNIGE, November 09, 2017)

When fishermen set out to sea, protected species are often caught accidentally in their nets together with the fish intended for sale. Marine biologists have been observing these patterns but until now, there was no statistical method for this kind of data. Creating a model is difficult since some species are almost never caught, and many technical variables are included – like the type of boats used. Statisticians from the University of Geneva together with researchers from Canada and Australia have now overcome this difficulty. Thanks to the new prospect of estimating potential by-catches for a fishing expedition, environmental policies can be built on it by prohibiting fishing in certain areas, for example. It also allows identifying the easily manipulable conditions, such as the depth of the hooks, which reduce the number of non-marketable species caught.
http://swissinnovation.org/news/web/2017/06-171109-55

Remote Sensing to Map Functional Diversity of Forests

(UZH, November 13, 2017)



Productivity and stability of forest ecosystems depend on the functional diversity of plant communities. Forests with higher diversity are generally more productive and stable over long timescales. In the past, functional traits of plants had to be measured by labor-intensive fieldwork of selected morphological and physiological traits. With airborne laser scanning and imaging spectroscopy researchers from the University of Zurich and the Jet Propulsion Lab at Caltech have now developed a new remote-sensing method. They are able to measure characteristics such as canopy height, foliage and branch densities, as well as physiological traits like the content of leaf pigments and water by observing how leaves reflect the light. This new kind of spatial information can be used for nature conservation and climate change mitigation strategies.
http://swissinnovation.org/news/web/2017/06-171113-58

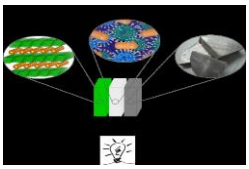
Smart Lamps to Reduce Lightning Energy Demand

(startupticker.ch, November 13, 2017)

LED lights have revolutionized illumination and the corresponding energy demand. Another, even bigger saving can be realized by implementing smart controls. The start-up LEDCity does just that by adding sensors to LED tubes, which automatically regulate the illumination according to the people in the room and the amount of the daylight. The novel LED tubes also detect movements through doors, allowing for lamps to be activated shortly before a person enters the room. In a pilot project at the Zurich University of the Arts, LEDCity succeeded in reducing the lightning energy demand by as much as 90 percent. The promising star-up has recently gained financial support from the Swiss Federal Office of Energy and the Swiss Climate Foundation.
http://swissinnovation.org/news/web/2017/06-171113-9c

"All-Solid-State" Sodium Batteries

(UNIGE, November 23, 2017)



Phones, laptops, electric cars – batteries are everywhere. And to meet the expectations of today's consumers, these batteries are increasingly light, more powerful and designed to last longer. Currently the most important technology for these applications is the lithium-ion battery technology: but the technology is expensive and contains a flammable liquid, which may represent a safety hazard, when the battery is abused. Researchers from EMPA and the University of Geneva, have developed a new battery prototype based on an "all-solid-state" approach and with sodium instead of lithium, this battery has the potential to store more energy while maintaining high safety and reliability levels.The battery has successfully passed first tests. The researchers are now working on increasing the number of possible charging cycles and conduct further testing.
http://swissinnovation.org/news/web/2017/06-171123-aa

Understanding Volcanic Eruptions

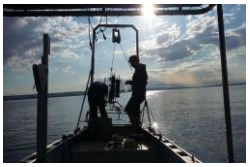
(UNIGE, November 24, 2017)

One of the least-understood processes in volcanology is the caldera resurgence. Calderas are formed during large volcanic eruptions when a magma chamber is emptied and its roof collapses. This produces a depression at the surface of diameters up to several kilometers. Years after the eruption, the ground sometimes experiences dramatic inflations, caused by magma injections. However, no major eruption will follow. A team of researchers from the Universities of Geneva and Roma Tre used thermal and experimental models to explain why the arrival of new magma doesn't produce another eruption in a caldera. They found that the non-erupted magma left after the initial event cools down and

thus its viscosity increases. The high viscosity stops the propagation of newly injected magma to the surface. This is an essential process for the formation of magma reservoirs responsible for the largest eruptions on Earth.
http://swissinnovation.org/news/web/2017/06-171124-f9

Measuring Oxygen in Lakes

(EPFL, November 24, 2017)



In the autumn, lakes undergo their annual water exchange as high winds, inflows from rivers and variations in water temperature mix up the water. During these colder months, the surface water, which is rich in oxygen, cools, sinks and mixes with the deeper layers, which brings fresh oxygen into the lakes' depths. To better understand how lakes breathe researchers from EPFL probed the depths of Lake Geneva in order to measure oxygen levels there. They took samples at different depths including the sediment using a robot equipped with microprobes capable of descending several hundred meters. Using these micrometric data, the researchers created a large-scale model of oxygen dynamics in the lake and drew on their knowledge of water flows to predict what may happen going forward.
http://swissinnovation.org/news/web/2017/06-171124-ab

Intelligent Waste Water Control System

(Eawag, November 24, 2017)

During heavy rainfall, wastewater treatment plants (WWTPs) are often unable to cope with the volumes of water arising, and some wastewater may then be discharged untreated into surface waters. Eawag, in cooperation with the HSR (Hochschule für Technik Rapperswil) and industrial partners, has developed a control system which ensures more efficient use of the storage capacity of existing wastewater infrastructure. Software known as INKA processes measurement data from the sewer network, information on the condition of receiving waters and precipitation data so as to calculate the optimal outflow volumes. The system ensures more even utilization of WWTP capacity in wet weather and controlled retention of excess wastewater within the sewer network. As well as improving water pollution control, this makes it possible to operate sewer networks more cost-effectively.
http://swissinnovation.org/news/web/2017/06-171124-50

Plant Defense Used by Maze Pest for Own Protection

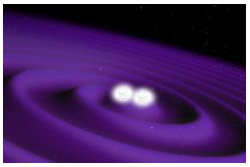
(UNIBE, November 28, 2017)

The Western corn rootworm continues to be on the rise in Europe. Why attempts to biologically target this crop pest by applying entomopathogenic nematodes have failed, can now be explained by the amazing defense strategy of this insect. In their new study, scientists from the University of Bern and the Max Planck Institute for Chemical Ecology show that the rootworm larvae are able to sequester plant defense compounds from maize roots in a non-toxic form and can activate the toxins whenever they need them to protect themselves against their own enemies. The scientists will now try to identify the genes or enzymes which enable the rootworms to outsmart maize defenses in order to ensure their own survival.
http://swissinnovation.org/news/web/2017/06-171128-91

7. Engineering / Robotics / Space

Gravitational Waves of Two Colliding Neutron Stars Detected

(UNIGE, October 16, 2017)



It was in 2015 that the scientific community first measured the passage of gravitational waves, whose existence had been predicted by Albert Einstein back in 1915. Now an international team of astronomers - including the University of Geneva (UNIGE) - has simultaneously measured a train of gravitational waves and a gamma-ray burst (an electromagnetic flash) caused by two neutron stars colliding. The discovery was made by using the laser interferometers LIGO and VIRGO. “It has long been speculated that events like these are behind some of the gamma-ray bursts [...],” explains Carlo Ferrigno, from UNIGE. “To verify this hypothesis, we had to detect the gravitational waves and a gamma-ray burst from the same region of the sky simultaneously.”
http://swissinnovation.org/news/web/2017/07-171016-aa

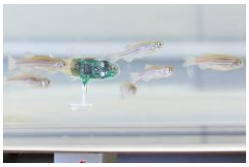
New Exotic Model of Dark Matter

(EPFL, October 26, 2017)

Recent research and observations of galaxy clusters show that there may be undiscovered physics behind dark matter as it is known today. The Standard Cosmological Model predicts that galaxy clusters have a very dense center that does not move. However, observations show that the center wobbles slightly and is less dense than predicted. More specifically, the observed wobbling points to dark matter behaving differently than predicted by the Standard Model. This research will be expanded to a greater survey size to further check results.
http://swissinnovation.org/news/web/2017/07-171026-2d

Robotic Spy Fish

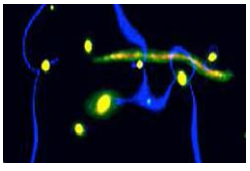
(EPFL, November 08, 2017)



Researchers at EPFL have designed a special kind of spy. The miniature fish-like robot can integrate perfectly into schools of zebrafish, a species known for its rapid direction changes. The secret agent is equipped with magnets that link it to an engine installed under the aquarium to propel it through the water. It is a bit longer than the fish but has the same proportions and appearance, which allows the researchers to study the social interactions between individual fish. According to the authors, the fish accepted the robot into their schools right away. Another field of interest is, however, miniature robotics. For example, the artificial fish’s swimming mechanism was designed with the help of biologists, but it gradually improved as the robot spent more time with the fish.
http://swissinnovation.org/news/web/2017/07-171108-4a

Gravitational Lensing to Study Star Formation in Distant Galaxies

(UNIGE, November 13, 2017)



There is a fair understanding of the fundamental mechanisms that regulate star formation in galaxies, from the interstellar matter to the diffuse clouds distributed in space, whose gravitational contraction leads to the birth of stars within large stellar clusters. But observations of distant galaxies have questioned this picture, the size and mass of these distant stellar nurseries largely exceeding that of their local counterparts. Researchers from University of Geneva (UNIGE) have now tackled this inconsistency by using gravitational lensing to observe the distant dust clouds. They found that in fact the clumps are much less massive than expected and that the mass is much closer to the ones already known from less distant galaxies.
http://swissinnovation.org/news/web/2017/07-171113-8f

Explaining the Universe without Dark Matter and Dark Energy

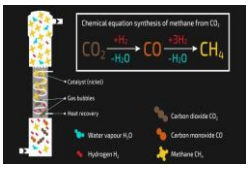
(UNIGE, November 22, 2017)

For close on a century, researchers have hypothesised that the universe contains more matter than can be directly observed, known as “dark matter”. They have also posited the existence of a “dark energy” that is more powerful than gravitational attraction. These two hypotheses, it has been argued, account for the movement of stars in galaxies and for the accelerating expansion of the universe respectively. A University of Geneva researcher has now shown that dark matter and dark energy might actually not exist. By using the concept of the scale invariance of space, he managed to deduct equations which can explain the expansion of the universe and the movement of stars without dark matter and dark energy. The researcher is now waiting for the sure arising controversy caused by his findings.
http://swissinnovation.org/news/web/2017/07-171122-49

8. Physics / Chemistry / Maths

New Process to Produce More Biogas Passed Stress Test

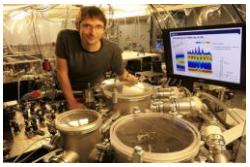
(PSI, October 24, 2017)



With a technology developed at the Paul Scherrer Institute PSI, around 60 percent more biogas can be produced from bio-waste than with conventional methods. In this new method CO2 generated during the fermentation is not removed but converted into methane itself by adding hydrogen to the gas. A 1,000-hour test at the Werdhölzli biowaste digestion and wastewater treatment plant in Zurich has now shown that the technology is both feasible in practice and economically viable. As a next step, the researchers want to investigate whether their process will also work with manure, which accumulates in large quantities in agricultural livestock management. At present the test facility is being adapted to meet the anticipated requirements.
http://swissinnovation.org/news/web/2017/08-171024-6c

World's Shortest Laser Pulse

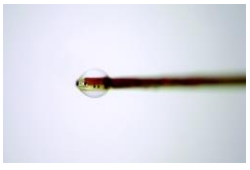
(ETH Zurich, October 27, 2017)



Researchers at ETH Zurich have succeeded at generating the world's shortest laser pulse, also the shortest controlled event created by humans. The pulse they created lasts only 43 attoseconds (43e-18 s) and has a large spectral bandwidth in the soft X-ray band. This duration is on the timescale of the movement of electrons, which means that chemical reactions can be controlled or imaged with a very high time resolution. One possible application is understanding the reactions in a solar cell, from the photon striking the cell until the charge is generated, which could potentially lead to better solar cells. Further research will focus on imaging more complex biomolecules than is currently possible.
http://swissinnovation.org/news/web/2017/08-171027-ea

New Method to Measure Brain Chemistry

(EPFL, November 03, 2017)

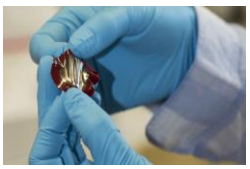


Neurologists often use electrical impulses to stimulate and read brain signals. But the chemicals that neurons produce in response to these impulses are poorly understand at this point, even though they can provide valuable information for understanding the mechanisms behind neurodegenerative diseases like Alzheimer’s and Parkinson’s. Researchers at EPFL have now developed a new device and analysis method that let

doctors measure the neurochemicals in a patient's brain. The device can both collect a patient's neurochemical feedback and form electrical connections with brain tissue. It is made up of electrodes and microchannels that are about half a hair in diameter are placed inside brain tissue. The next step will be to develop a method for analyzing the proteins and neurotransmitters in cerebral fluid.
http://swissinnovation.org/news/web/2017/08-171103-9a

Special Rubber Generated Electricity

(EMPA, November 10, 2017)



Researchers at EMPA have developed a special rubber that generates electricity if stretched and compressed. This thin, organic, and flexible film might be implanted in the human body to power a pacemaker, for instance, or it could be used in clothing to generate electricity from the wearer's movements. The material, made of polar nanoparticles and an elastomer, is able to convert mechanical movements into electrical charges thanks to the so-called piezoelectric effect: A current is generated because the internal polarization of the rubber film changes when stressed. The production of the material, however, is rather complicated. The internal polarization has to be adjusted using a strong electrical field, which aligns the molecules in one direction.
http://swissinnovation.org/news/web/2017/08-171110-2e

9. Architecture / Design

Ultra-Thin Concrete Roof

(ETH Zurich, October 12, 2017)

Researchers from ETH Zurich have built a prototype of an ultra-thin, curved concrete roof using innovative digital design and fabrication methods. Instead of formwork using non-reusable custom-fabricated timber or milled foam, the researchers used a net of steel cables, designed by an algorithm and stretched into a reusable scaffolding structure. This cable net supported a polymer textile that together functioned as the formwork for the concrete. The self-supporting, doubly curved shell roof has multiple layers: the heating and cooling coils and the insulation are installed over the inner concrete layer. A second, exterior layer of the concrete sandwich structure encloses the roof, onto which thin-film photovoltaic cells are installed. The tested novel formwork system will be used in an actual construction project for the first time next year.
http://swissinnovation.org/news/web/2017/09-171012-3b

10. Economy, Social Sciences & Humanities

Female Brains React Stronger to Prosocial Behavior than Male Brains

(UZH, October 09, 2017)

Behavioral experiments have shown that when women share a sum of money more generously than men. To gain a more in-depth understanding of this behavior, neuroscientists from the Department of Economics looked at the areas of the brain that are active when decisions of this kind are made. They found that the striatum (the reward system) was more strongly activated in female brains during prosocial

decisions than during selfish decisions. By contrast, selfish decisions led to a stronger activation of the reward system in male brains. “Future studies need to take into account gender differences more seriously", explains Alexander Soutschek from University of Zurich.
http://swissinnovation.org/news/web/2017/10-171009-c8

Violent Communities, Violent Kids?

(UNIBAS, November 06, 2017)

A Europe-wide research project with the aim to better understand the interactions between psychosocial and genetic factors in conduct disorders has released a new study, conducted by scientists at the University and the University Psychiatric Hospital of Basel. It shows that children and adolescents who are regularly confronted with violence in their community have a greater tendency to show antisocial behavior. The teams investigated the strength of the association in over 1100 children and adolescents between the ages of 9 to 18 and living in seven European countries. The relationship was found in both healthy children as well as in those who already had behavior problems. This result suggests that more prevention programs should be established in neighborhoods with high violence in order to prevent the potential isolation of young people with a high violence exposure.
http://swissinnovation.org/news/web/2017/10-171106-f6

Music in Your Head

(EPFL, November 10, 2017)

When we listen to music, different parts of our brain process different information, and with today’s technology it’s easy to observe this activity in our brain. Understanding what happens when we imagine music – hearing it just in our brains rather than our ears - however, is much trickier. Researchers at EPFL and the University of California, Berkeley can now see what happens when we hear music without auditory stimulation. They could show for the first time that the auditory cortex processes auditory information in the same way as it does when stimulated by real sound. In order to measure the relevant neuron responses, the scientists made use of electrocorticography – an invasive technique that relies on implanted electrodes. A next step for scientists will be to replicate these results with patients who have lost the ability to speak – and determine how to help them.
http://swissinnovation.org/news/web/2017/10-171110-fe

Future of Mobility

(University of St. Gallen, November 20, 2017)

On the topic of transport, most people think of noise, pollution, hustle, bustle and stress. Researchers from the Centre for Aviation Competence (CFAC) of the University of St.Gallen discovered now that by the year 2040 people's relationship to transport and transport itself will change fundamentally. They found that In future, customers will want transport to be 100% secure, punctual and predictable. The services on offer should be environmentally friendly, emission free, climate friendly and punctual. The mobility industry is becoming more dynamic and complex. Transport systems are better networked and sharing platforms promote a new relationship with transport. They also found that mobility on demand and a car as utility rather than ownership will become more important.
http://swissinnovation.org/news/web/2017/10-171120-c5

Migration Model for the UK

(ETH Zurich, November 30, 2017)

British Prime Minister Theresa May has no easy task ahead of her as she negotiates her country's future relationship with the EU. ETH Zurich researchers have now developed a feasible approach for the migration issue in post-Brexit negotiations between the UK and EU. An existing mechanism in Switzerland's bilateral treaties served as inspiration. Michael Ambühl and Daniela Scherer from ETH Zurich have developed a new and versatile migration model with a safeguard clause that, on the one hand, guarantees free movement, but, on the other hand, temporarily measures it for instances of exceptionally high migration. "Using mathematical models allows political representatives to turn a sometimes emotional discussion into a quantitative and clear-headed negotiation," says Ambühl.
http://swissinnovation.org/news/web/2017/10-171130-46

11. Startups / Technology Transfer / IPR / Patents

Lab-on-Skin Sensor Measuring Biochemical Information in Sweat

(startupticker.ch, October 13, 2017)

Xsensio SA, a Swiss specialist in wearable sensing technology, develops a proprietary Lab-on-Skin sensing platform for next-generation wearable devices that tracks biochemical information at the surface of the skin, providing unprecedented real-time information on health and wellness, in a simple and non-invasive way. Together with its partners, including Fraunhofer IZM, OmegaLambdaTec GmbH, R-DAS, s. r. o. and the Vrije Universiteit Amsterdam (Stichting VU), Xsensio has now won a €2.4 million Eurostars grant for the XPATCH project. The aim of the project is to develop a breakthrough wearable product that will reveal and explore a new dimension of data in real-time, namely biochemical information in sweat, leveraging Xsensio's proprietary Lab-on-Skin wearable sensing platform.
http://swissinnovation.org/news/web/2017/11-171013-b4

Hearing Aid with Biometric Calibration

(HSR, October 16, 2017)

Hearing aids with beamforming technology are a great help for people with hearing loss, but they have a disadvantage: Since the acoustic perception is significantly influenced by the shape of the individual ear, especially devices that are worn in the ear, didn't work equally well with all users. Researchers from HSR have now succeeded in revolutionizing the hearing performance of in-the-ear hearing aids with biometric calibration. Behind this is a method where an anatomical imprint of the ears is determined in order to develop, with the help of a statistical model, an optimal beam former for each ear. The product, developed for the hearing solutions company Phonak, has now been released as Phonak Virto™ B.
http://swissinnovation.org/news/web/2017/11-171016-a6

Electric Scooters to Make Cities Cleaner

(Tages Anzeiger, October 28, 2017)

Sharing mobility is booming. The start up Electric Feel wants to take this trend further by establishing networks of electrical scooters in Europe's cities. Together with a partner, the ETH spin-off is already operating 2000 scooters in Barcelona, Madrid, Lisbon and Rome. Now they are in negotiation with Zurich - a city where the carpool service Uber hasn't had a breakthrough yet due to strict regulations of the local

government. The scooters would be available in a so-called free-floating service. They don't have fixed stations but can be parked in any lot of the city, free of any fees. An app will tell the user where the closest e-scooter can be found. With software developed at ETH, Electric Feel plans to predict certain mobility patterns to avoid chaos, as the city has experienced at times with its public bikes.
http://swissinnovation.org/news/web/2017/11-171028-8d

New PSI Fund to Support Researchers on Entrepreneurial Career Path

(PSI, November 08, 2017)

To help researchers to develop their ideas into a product, the Paul Scherrer Institute has brought a new funding instrument into being, the Founder Fellowship. This is an 18-month grant that supports young researchers and engineers of PSI on the entrepreneurial career path, financially as well as with coaching and counseling. The Founder Fellowship lasts 18 months and is endowed with 150,000 Swiss francs per person, which the winner can use for salary, material, or other costs. They also get full access to PSI research facilities. We want to promote entrepreneurship and an entrepreneurial culture at PSI, explains John Millard of the Technology Transfer office. After the fellowship the researchers have to leave PSI and can devote themselves to the search for investors and found a spin-off.
http://swissinnovation.org/news/web/2017/11-171108-7e

12. General Interest

New 10-Franc Note Released

(SNB, October 11, 2017)

The Swiss National Bank (SNB) started issuing the new 10-franc note on 18 October 2017. Following the 50-franc and 20-franc notes, it is the third of six denominations in the new banknote series to be released. The design of the 10-franc note focuses on Switzerland's organisational talent, as expressed in the key motif of time. Core design elements in the new series are the hand and the globe, which appear on every denomination. The innovative combination of complex security features and sophisticated design provides state-of-the-art anti-counterfeiting protection. The next denomination, the 200-franc note, will be issued in autumn 2018.
http://swissinnovation.org/news/web/2017/12-171011-c4

13. Calls for Grants/Awards

Call: Innovation Partnership Grants with China, Japan, South Korea and the ASEAN Region

(ETH Zurich, November 25, 2017)

Innovation partnership grants will support the establishment of cooperation between Swiss researchers from universities, universities of applied sciences or public research institutes with non-academic innovation agents in China (including Hong Kong and Taiwan), Japan, South Korea and member states of ASEAN. These agents can be corporates, SMEs or start-ups, innovation parks or similar entities with a focus on applied sciences or technical development. The goal of the innovation partnership grants is to initiate long-

term partnerships with mutually beneficial concrete outcomes. The call is open to all scientific disciplines and fields of research. Deadline of the project submission is the 28 February 2018 and the grant sum is CHF 20,000 max. A second call for innovation partnership grants is planned for spring 2019.
http://swissinnovation.org/news/web/2017/13-171125-5e

Upcoming Science and Technology Related Events

IC Colloquium: Blockchains and the Future of Distributed Computing
December 18, 2017
http://ow.ly/LtJi30hcipb
IT, Blockchain, Innovation
Lausanne

International Symposium on Chemical Biology 2018
January 12, 2018
http://ow.ly/932t30hcjjA
Life Sciences, Biology, Innovation
Geneva

International Conference on Location Based Services - LBS 2018
January 15-17, 2018
http://lbs18.ethz.ch/
Location Based Services, Geodesy, Cartography
Zurich

VPE Swiss Workshop
January 18, 2018
http://ow.ly/9eru30hcnow
Engineering, Computer Aided Design, Norms and Regulations
Rapperswil

Applied Machine Learning Days 2018
January 28-30, 2018
http://ow.ly/gdkv30hciQm
IT, Machine Learning, Computing, AI
Lausanne

High Power Electromagnetics Workshop
February 5, 2017
http://ow.ly/ahl330hck2E
Electromagnetics, NEMP, IEMI
Lausanne

Symposium Hydrogen & Energy - Latsis Symposium
February 11-16, 2018
http://ow.ly/akGt30hcmMR
Hydrogen Storage, Fuel Cells, Batteries
Lausanne

International Symposium on Reactive Intermediates and Unusual Molecules (isrium) 2018
July 15-20, 2018
http://www.isrium2018.ethz.ch/
Chemistry, Research
Ascona

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