



# Science-Switzerland, October- November 2015

News on Swiss science, technology, education and innovation

## Table of Contents

1. Policy .....	1
2. Education .....	2
3. Life Science .....	3
4. Nano / Micro Technology / Material Science .....	11
5. Information & Communications Technology .....	12
6. Energy / Environment.....	13
7. Engineering / Robotics / Space.....	15
8. Physics / Chemistry / Math.....	18
9. Architecture / Design.....	19
10. Economy, Social Sciences & Humanities .....	19
11. Technology Transfer / IPR / Patents .....	20
12. General Interest.....	20
13. Calls for Grants/Awards .....	20
Upcoming Science and Technology Related Events.....	21

## Switzerland Topps Global Competitiveness Report

(World Economic Forum, November 06, 2015)

The Global Competitiveness Report is an annual assessment of the factors driving productivity and prosperity in 140 countries. First place in the Global Competitiveness Index rankings, for the 7th consecutive year, goes to Switzerland. Switzerland strong performance in all 12 pillars of the index explains its remarkable resilience throughout the crisis and subsequent shocks. Yet recent developments have created a number of downside risks. These include the sluggish recovery in key trading partner countries; the appreciation of the Swiss franc following the exit of the exchange rate floor; near-zero inflation; and negative real interest rates. Uncertainty about future immigration policy following the referendum against “mass immigration” could undermine Switzerland’s capacity to tap into the global talent pool needed to power its economy.

Country	GCI 2014-2015	GCI 2015-2016
Switzerland	1	1
Singapore	2	2
United States	3	3
Germany	5	4
Netherlands	8	5
Japan	6	6
Hong Kong	7	7
Finland	4	8
Sweden	10	9
United Kingdom	9	10

<http://swissinnovation.org/news/web/2015/00-151106-a1>

## 1. Policy

### Towards Switzerland’s Full Association with EU’s Research Frameworks

(EPFL, October 01, 2015)

The presidents of ETH Zurich and EPFL met with various high-ranking EU representatives to discuss the urgency and importance of including Switzerland in the EU’s Framework Programmes for Research and Innovation as a participant with full association. Ever since the controversial Initiative Against Mass Immigration was adopted in Switzerland in 2014, Swiss participation in the EU’s funding programmes as well as various long-standing scientific collaborations between Swiss and EU researchers have become jeopardised. Additionally, excluding Switzerland would also close doors for many European researchers hoping to pursue science careers in Switzerland, many of whom are recruited as young professors, or stay after their studies as engineers, natural scientists, and entrepreneurs.



<http://swissinnovation.org/news/web/2015/01-151001-39>

### Parliamentarians Well Prepared for the First Session

(ETH Zurich, November 28, 2015)

A working group headed by Michael Ambühl, Professor of Negotiation at ETH Zurich, held an introductory event by the end of November for 14 of the newly elected members of the Swiss federal parliament. Experts from different fields gave lectures at the two-day event, while former members of parliament shared their experience. The objectives of the seminar were “to give background knowledge on the workings of parliament” and “to give participants the





opportunity to form cross-party contacts,” says Michael Ambühl. The seminar, attended by members from different parties and cantons, also dealt with complex issues, such as macroeconomic fundamentals and Swiss social security law. Ambühl concedes that it is not possible to acquire extensive knowledge in such a short period of time. „But newly elected members of parliament must be able to grasp a subject quickly and know where they can find more reliable information on it. This is where our experts were definitely able to provide assistance,” says Ambühl. If there will be another seminar in four years, has not yet been decided.

<http://swissinnovation.org/news/web/2015/01-151128-7a>

## 2. Education

### Newly Appointed Professors at ETH Zurich & EPFL

(admin.ch, October 01, 2015)

The ETH Board appointed a total of 23 individuals as professors. For ETHZ: Dr. Christoph Keller (\*1981), currently a post-doctoral student at Rutgers University, New Jersey, USA, as Assistant Professor of Mathematical Physics; Professor Onur Mutlu (\*1978), currently Associate Professor at Carnegie Mellon University, Pittsburgh, USA, as Full Professor of Computer Science; Professor Gunnar Rätsch (\*1973), currently Associate Professor at the Memorial Sloan Kettering Cancer Center in New York, USA, as Full Professor of Biomedical Informatics. For EPFL: Dr Corentin Fivet (\*1985), currently a post-doctoral fellow at MIT as Tenure Track Assistant Professor of Architecture and Design of Structures; Dr Romain Fleury (\*1987), currently research assistant at the University of Texas, Austin, USA, as Tenure Track Assistant Professor of Electrical and Electronic Engineering; Dr Mikhail Kapralov (\*1983), currently a post-doctoral student at the IBM T. J. Watson Research Center, New York, USA, as Tenure Track Assistant Professor of Computer Science and Communication Systems.

<http://swissinnovation.org/news/web/2015/02-151001-37>

### Preparing High School Students for the Digital Future

(Aargauer Zeitung, November 05, 2015)

In an effort to better prepare young adults for the jobs of the future, high school students in the canton of Aargau will be required to take computer science classes starting in 2016. The new computer science classes aim to provide the students with skills in the areas of algorithms, coding, computer systems, networks and cyber security. Unlike previously offered facultative computer classes, the new class will be mandatory and contribute to a student's grand point average in the same way as courses in language, history and mathematics. This will have the additional effect of boosting the importance of the STEM curriculum in the education of future university students.

<http://swissinnovation.org/news/web/2015/02-151105-9d>

### Swiss Educational Institutions

(SBFI, November 13, 2015)

In autumn 2013 there were 10,630 educational institutions in Switzerland including all levels. Most educational institutions are based within compulsory education (89%). They accommodate 58% of all people in education and 66% of teachers. Only 7% of schools are for upper secondary level: they accommodate 23% of all people in education and 19% of teachers. At tertiary level, the proportion of educational institutions is 3%. They accommodate 14% of teachers for 18% of persons in education. The balance corresponds to schools that cannot be differentiated by educational level («undefined level»). This category is essentially for international schools which offer foreign teaching programmes. In 2013/14, the biggest share of schools within the compulsory education system were pre-primary level (first learning cycle and kindergarten), accounting for 40%. This was closely followed by primary level (34%). Lower secondary level accounts for 12% of schools, while special schools make up 4%. The other 10% include post-compulsory education schools (vocational education and training (VET), general education, professional education and training (PET) and universities) and schools of no defined level.

### Eckenstein-Geigy Foundation Sponsors a New Professorship in Epidemiology and Household Economics

(University of Basel, November 26, 2015)

With an amount totalling 14 million Swiss francs, the Eckenstein-Geigy Foundation is sponsoring a new professorship in Epidemiology and Household Economics at the University of Basel. The donation spread over 10 years is set aside for comparative studies in this subject area within the context of the program Health economics and human behavior. A new research program will be launched together with the professorship, based at the Swiss Tropical and Public Health Institute (Swiss TPH). “The fact that the donors are consciously supporting the interdisciplinary approach of the research shows that our full-fledged university in Basel offers the right conditions for tackling the major challenges facing society”, says Prof Andrea Schenker-Wicki, Vice-Chancellor of the



university of Basel. The foundation - one of the largest sponsors of the university center Basel - is especially interested in global healthcare problems in low-income regions. Nevertheless, the focus will also be on highly developed healthcare systems in countries such as Switzerland. The professorship will be awarded through a regular appointment procedure at the University of Basel with an international call for candidates.

<http://swissinnovation.org/news/web/2015/02-151126-c0>

### Three US Professors receive University of Basel honorary doctor

(University of Basel, November 30, 2015)

The University of Basel celebrated its Dies Academicus with a traditional ceremony in Basel's St. Martin's Church. Seven individuals were awarded honorary doctorates during the ceremony. Three of them live and research in Massachusetts. MIT Sloan Prof. Dr. Ernst R. Berndt received an honorary doctorate from the Faculty of Business and Economics for his work on the measurement of output and prices in economic sectors with high levels of technological development. With the conferral of an honorary doctorate, the Faculty of Psychology honored Prof. Dr. Irving Kirsch, Associate Director of the Program in Placebo Studies and a lecturer in medicine at the Harvard Medical School, for his outstanding accomplishments in the study of the influence of expectations on the effects of treatment. The Faculty of Medicine awarded its honorary doctorate to Prof. Dr. Philip Leder of Harvard Medical School. Leder is a medical doctor and researcher known for his pivotal work in molecular biology and genetics research, and is one of the pioneers of modern molecular biomedicine.

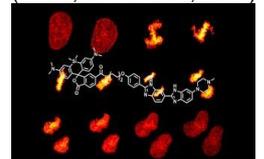
<http://swissinnovation.org/news/web/2015/02-151130-bc>

## 3. Life Science

### New DNA Stain for Improved Cell Imaging

(EPFL, October 01, 2015)

Studying cells can be difficult especially because of their sensitivity to light when put under the microscope. Luckily, scientists at EPF Lausanne have developed a solution to this problem. Publishing in Nature Communications, Kai Johnsson and colleagues have now developed a DNA stain that is not toxic and can be activated in the red spectrum of light (which does not damage cells). They achieved this by combining a fluorescent molecule active in the red part of the light spectrum with a well-known DNA stain called Hoechst, resulting in a stain which allows for study of live cells to exceed 24 hours. This is crucial for biologists intending to track processes such as cell division in real time. The researchers are now preparing to commercialise their product through their EPF Lausanne startup company, Spirochrome.



<http://swissinnovation.org/news/web/2015/03-151001-55>

### Glutamate is Essential for the Brain

(Université de Genève, October 02, 2015)

Glutamate is an amino acid with very different functions: in the pancreas, it modulates the activity of the pancreatic  $\beta$ -cells responsible for insulin production, whereas in the brain it is the main excitatory neurotransmitter. Unlike other organs, the brain cannot draw its energy from lipids, an energy resource widely present in the body. The blood-brain barrier, which protects it from the pathogens and toxins circulating in the blood, indeed limits the passage of these lipids. In recent years, Glutamate has been suspected to play an additional role in the functioning of the brain. By discovering how the brain uses glutamate to produce energy, researchers at the University of Geneva (UNIGE) confirm this hypothesis.

<http://swissinnovation.org/news/web/2015/03-151002-a5>

### Sugar Structure Controls Antibodies

(University of Zurich, October 06, 2015)

Antibodies are an important part of the immune system that destroy cells causing disease. However, antibodies can also be misdirected to destroy a person's own cells when that person suffers from autoimmune disease. Researchers at the University of Zurich have discovered that, in persons suffering from autoimmune disease, the type of sugar structure in the antibody affects how much of a negative effect it has on good cells. Specifically, antibodies with sialic acid are less harmful than those with other sugars. This finding could lead to new treatments for autoimmune disease.

<http://swissinnovation.org/news/web/2015/03-151006-45>



## Breakthrough: Digital Reconstruction of Brain Tissue

(EPFL, October 08, 2015)

EPFL scientists working on the Blue Brain Project, the simulation core of the Human Brain Project, have together with their international team of collaborators successfully completed their first 'draft' of their digital reconstruction of part of a rat brain. Publishing their results in the distinguished journal *Cell*, the scientists' breakthrough involves a detailed computer representation of brain tissue containing some 30,000 neurons connected by approximately 40 million synapses. To achieve this, thousands of experiments were conducted on the neurons and synapses of young rats in order to catalogue each type of neuron and synapse found. Then, a supercomputer was used to simulate the circuitry connecting the neurons that solved literally billions of equations just to simulate each 25 microsecond time-step in the simulation. The international team of 82 scientists working at institutions in 8 different countries is one step closer to achieving the full simulation of the human brain.

<http://swissinnovation.org/news/web/2015/03-151008-8e>

## Genetically Modified Cassava for Vitamin B6 Deficiency

(ETH Zurich, October 09, 2015)

The cassava tuber is a staple food in many regions of Africa, where deficiencies in vitamin B6 occur with high frequency. Though the cassava is calorie-dense, it generally contains few vitamins; 1.3kg would need to be consumed per day to fulfill the recommended intake of vitamin B6 in humans. Publishing in *Nature Biotechnology*, plant scientists at ETH Zurich and the University of Geneva successfully report their ability to genetically modify cassava so that it contains several-fold higher levels of vitamin B6. This increase in vitamin B6 levels was achieved by inserting certain genes into the cassava genome responsible for the synthesis of B6. However, legislation in some of the developing countries whose populations suffer highly from vitamin B6 deficiency may be challenging to the distribution of this cassava. Nevertheless, legislation in countries such as Uganda, Kenya, and Nigeria currently allow for field trials of genetically modified plants, representing an important step in the ability to test growing this cassava variety under field conditions.



<http://swissinnovation.org/news/web/2015/03-151009-27>

## Controllable Protein Gates in Artificial Nanovesicles

(University of Basel, October 09, 2015)

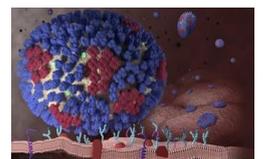
Critical to drug delivery is the ability to safely transport therapeutic agents to the target site within the body. This process is achievable using a capsule such as a vesicle containing active chemical agents which would come into contact with the target on demand at the correct time. Researchers at the Swiss Nanoscience Institute led by Prof. Cornelia Palivan at the University of Basel report their development of a pH-sensitive protein gate embedded in the membrane of synthetic nanovesicles which opens to expose the capsule's contents to its target site, e.g. inflamed or cancerous tissue which is typically slightly acidic. Upon opening these gates, the contents can react with incoming substrates and the products of the reactions would be released. The researchers envision applications in medicine and other fields which require precise distribution of reactants such as catalysis.

<http://swissinnovation.org/news/web/2015/03-151009-84>

## Genetic Variation Determines Immune Response

(EPFL, October 12, 2015)

Different people respond differently to viral infections; varying degrees of immunity to a given virus can be determined by measuring the concentration of the relevant antibody in the blood. The question researchers at EPF Lausanne's Laboratory of Human Genomics of Infectious Diseases are interested in is why this arises. In a genome-wide association study of 2000 people, computational power was exploited to scan the genomes to find patterns in genetic variations linked to particular diseases. The EPFL scientists in collaboration with those at the Max Planck Institute have discovered that a specific cluster of genes is linked to the immune response towards four specific viruses. Furthermore, they also discovered that these genes are all located on the same chromosome, and that they are responsible for producing proteins which attach to viruses and act as targets for immune cells combating the virus. The scientists are optimistic about the applications of genomic information to exploring, understanding, and perhaps even treating disease by boosting immunity in possible future work.



<http://swissinnovation.org/news/web/2015/03-151012-77>

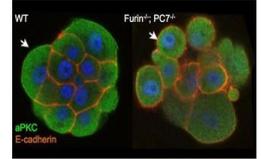


### Three Enzymes Jointly Control Growth

Fetuses develop from a small mass of stem cells whose differentiation is controlled by proteins and enzymes. Early in the development, cells form a morula compaction, where the outer cells differentiate but the inner cells remain stem cells. Researchers at EPFL have discovered three enzymes that work cooperatively to control the development of this structure. Using tests on mice, they also discovered that even if one or two of the enzymes are blocked, the remaining one can continue the development, helping make this process robust.

<http://swissinnovation.org/news/web/2015/03-151013-5a>

(EPFL, October 13, 2015)

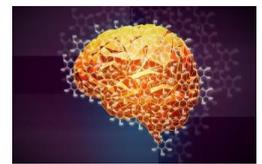


### Geologists' Imaging Tool for Brain Studies

Glucose is a sugar and form of fuel; half of our glucose is consumed by the brain. The question that researchers from EPF Lausanne have been trying to answer is this: what exactly happens to glucose in the brain? What is it used for and where does it go? Using a microscope originally developed to study the isotopic composition of rock samples called NanoSIMS, the scientists were able to gain a sub-cellular understanding of glucose pathways in the brain and preliminarily establish that neurons accumulate more carbon from glucose in their nuclei compared to other cellular compartments and astrocytes. This powerful tool may in the future be used in the study of metabolic signatures of certain diseases such as Alzheimer's since NanoSIMS is able to provide such accurate imaging capabilities.

<http://swissinnovation.org/news/web/2015/03-151014-9f>

(EPFL, October 14, 2015)



### Partial 3D Structure of Inflammasome at the Atomic Level

(University of Basel, October 14, 2015)

Upon attack by invading pathogens, a protein complex called the inflammasome works by inducing the inflammation and death of the infected cells. These events form part of the body system's immune response in an effort to prevent the spread of the pathogen. Combining two classical methods of structure analysis, researchers at the University of Basel have now been able to gain invaluable insights into the structure of the inflammasome at the atomic scale. More specifically, the scientists used a combination of cryo-electron microscopy and NMR spectroscopy to elucidate the structure of a protein filament integral to the inflammasome's assembly and therefore function. Their findings could lead to a better understanding of auto-inflammatory disorders in the future.

<http://swissinnovation.org/news/web/2015/03-151014-98>

### Smoking-related Deaths Killing More Women

(20min, October 15, 2015)

According to the Swiss Federal Office of Statistics, 15% of all deaths between 1995 and 2012 were related to tobacco use; of these 9500 deaths, 58% were women. Smoking is associated with health conditions such as lung cancer and cardiovascular disease, and while the incidence of these diseases has been dropping in men, it has been increasing amongst women. The reason for this trend in tobacco-related deaths involves the change of consumer habits, particularly amongst women who began to smoke more at the turn of the millennium than men. The fact that smoking cigarettes leads to a suppression of appetite has been much exploited by women to prevent weight gain according to Thomas Cerny, an oncologist at the St. Gallen Canton Hospital. Other statistics released in the study include: approximately 25% of the population aged 15 or over smokes, and every third smoker consumes a pack or more per day.

<http://swissinnovation.org/news/web/2015/03-151015-a7>

### Chicken Ice Cream: a Swiss Culinary Innovation

(20min, October 15, 2015)

A subsidiary company of Switzerland's famous supermarket chain Migros based in St Gallen most recently launched its newest creation at the food fair 'Taste the Future 2015' in Cologne: chicken ice cream. Better known as 'Poulet Glace', the product was developed by Micarna and is available in three unique flavours: pineapple curry, tarragon, and caramel. Notably, 19% of the ice cream contains pureed chicken making it particularly high in protein. Its consistency is that of normal ice cream, and its savoury flavour makes it perfect as a starter or aperitif served in a cup according to Micarna. However, it is unlikely to hit the shelves of Migros any time soon as production has



been limited to small quantities for the purposes of the food fair. In the mean time, Migros is looking into other distribution options such as through its Chickeria restaurants.

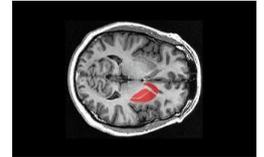
<http://swissinnovation.org/news/web/2015/03-151015-6b>

### How the Brain Triggers Action

EPFL scientists have identified specific neurons in the striatum that contribute to driving motivated behaviors like movement. It identifies a specific type of neurons in the striatum where information turns into action, casting light on a core function of the brain. But there is long-term potential too, as the study highlights a means for possible treatments of diseases that affect the action initiation and motor control, such as Parkinson's and Huntington's.

<http://swissinnovation.org/news/web/2015/03-151021-c7>

(EPFL, October 21, 2015)



### New Therapies to Combat Staphylococcus aureus

Staphylococcus aureus is a major cause of infections in skin and soft tissue, and of severe pneumonia. Scientists are investigating new strategies to combat this pathogen, including many strains that have become resistant to antibiotic treatments. One of this bacterium's most powerful weapons is the  $\alpha$ -toxin, which kills cells by piercing their membranes and causing them to disintegrate. An international project led by Stanford University in California, in collaboration with the University of Geneva (UNIGE), has identified components of our cells that modulate the virulence of this toxin. They include the PLEKHA7 protein. The researchers discovered that cells recover from damage caused by  $\alpha$ -toxin when this protein is inhibited. This opens the way for new potential therapies targeting PLEKHA7. The findings are published in PNAS.

<http://swissinnovation.org/news/web/2015/03-151021-12>

(Université de Genève, October 21, 2015)

### The Peculiar Antigen Stability in Tuberculosis Bacteria

Researchers at the Swiss Tropical and Public Health Institute (TPH) and the University of Basel have reported peculiar patterns in antigen variations of tuberculosis bacteria. In a genome analysis of 216 tuberculosis strains Sebastien Gagneux, assistant professor at the TPH and his team found that the antigens presented on the surface of Mycobacterium tuberculosis are highly conserved, exhibiting similar properties across strains. They suspect that the hyper conserved antigens could provoke a severe immune response, creating an evolutionary advantage by allowing the bacteria to enter the lungs and thus be transmitted through coughing. They further found more variable antigens that trigger a lesser immune response and could provide a new angle of attack that could be taken advantage of by future vaccines.

<http://swissinnovation.org/news/web/2015/03-151023-c1>

(University of Basel, October 23, 2015)

### Siberian Jays Recognize Kinship

Researchers from the University of Zurich have discovered that Siberian jays, a bird found in Scandinavia and Siberia, can recognize how closely related they are to others of their species. These birds live cooperatively, but they cooperate only with close relatives while acting aggressively towards distant relatives. It is not clear how kinship is determined, but it is an evolutionary advantage since it helps spread an individual's own genes and possibly helps avoid inbreeding.

<http://swissinnovation.org/news/web/2015/03-151026-c6>

(University of Zurich, October 26, 2015)



### Intestinal Worms Communicate with Gut Bacteria

Despite causing serious health problems, gut worms can actually help the immune system of its host as an indirect way of protecting themselves. Because of their long co-evolution with mammals, helminths have developed a close relationship with their host's immune systems, to the point that they can regulate the host's immune system in beneficial ways. Researchers from EPFL looked at the effects of helminths that infect pigs. After chronic infection with the helminths, they discovered that the animals' metabolism had been

(EPFL, October 28, 2015)





changed drastically; specifically, they produced increased levels of a class of fats in the gut called “short-chain fatty acids”. These fatty acids are produced by the microbiome, and can activate a family of receptors that in turn beneficially influence the immune system.

<http://swissinnovation.org/news/web/2015/03-151028-46>

### Cell Membranes Wind up Like a Watch

(Université de Genève, October 29, 2015)

The cell membrane is very elastic. It can change shape whenever needed, particularly during cell division or when a virus detaches itself from the cell. This membrane deformation is caused by a protein complex called ESCRT-III, discovered 15 years ago but whose functioning was previously unknown. An interdisciplinary Franco-Swiss research team from the University of Geneva (UNIGE), Paris-Sud University and Aix-Marseille University, found out that this protein complex forms a spiral on the surface of the cell and acts like a watch spring. It took the combined skills of biochemists, physicists and theorists to understand ESCRT-III's molecular mechanics. Using an atomic force microscope (AFM), the researchers observed the complex's movements in real-time and on a nanoscale. The research findings are published in *Cell*.

<http://swissinnovation.org/news/web/2015/03-151029-90>

### Human Brain Project Gets EU Green Light

(Le Temps, October 30, 2015)

The consortium managing the Human Brain Project (HBP) and its main donor, the European Union (EU), have signed a Framework Partnership Agreement (FPA) after major reforms were implemented. The EU agrees to provide half of the HBP's budget of one billion euros. This large-scale European project to study and model the human brain can now proceed from its launch phase initiated in 2013 to become fully operational. The agreement ends a controversy that has shaken the HBP to its scientific and organizational foundations. The controversy began in spring 2014 when more than 800 researchers sent a petition to the European Commission, decrying the project's unrealistic scientific goals and denouncing inadequate governance. Subsequent reforms encompass infrastructure, governance, a European legal entity, and cognitive neuroscience.

<http://swissinnovation.org/news/web/2015/03-151030-0f>

### The Cholera Bacterium Survives Inside Amoebas

(EPFL, November 02, 2015)

EPFL scientists have discovered that the cholera bacterium can hitchhike aquatic amoebas. It establishes itself in a water-discharge vacuole and then grow inside it even if the amoeba retreats into the form of a cyst. By living in the amoeba, the cholera bacterium can bypass threats in the surrounding water, moreover it can protect itself from external stresses such as the acidity of the human stomach. Once the bacteria grow to sufficient numbers, they escape the encysted amoeba by lysing their way out, and killing it in the process. The findings of the study describing this new host-pathogen interaction pathway could have major implications for cholera transmission to humans.



<http://swissinnovation.org/news/web/2015/03-151102-14>

### High Dose of Vitamin D for Bone Health

(ETH Zurich, November 02, 2015)

There has been debate about the proper dosage of vitamin D needed to maintain healthy bones, especially in postmenopausal women. However, a new study from ETH Zurich makes the case for a high dose. The study tested calcium absorption at different vitamin D levels using a calcium isotope. The women in the test group were given a dose of calcium-41, which distributed itself into their bones. Six months later they were given increasing levels of vitamin D, and then urine samples were measured for the ratio of calcium-41 to more common calcium-40. This ratio determined how much calcium was lost, and results show that a high dose of vitamin D minimizes calcium loss.



<http://swissinnovation.org/news/web/2015/03-151102-7d>

### Investigating the (Un-)Packaging of DNA During Embryonic Development

(EPFL, November 04, 2015)

In a new study, researchers from the EPFL have used super-resolution microscopy in order to reveal the organization of genes controlling embryonic development. In eukaryotic cells, DNA is tightly packed in what is



called the 'chromatin complex', a structure that gets partly unwound during the transcription of active genes. Using their technique, which allows the bridging of the resolution gap and thus the imaging of subcellular structures, the scientists were able to look at the unpacking of the chromatin structure during the transcription of genes central to the control of fetal development. In their observations they were able to find differences in shape and activity between the same genes in digit and neuronal cells. The knowledge about the 3D organization of genes could help researchers in the study of the mechanisms that are driving the opening and closing of the chromatin complex during gene regulation.

<http://swissinnovation.org/news/web/2015/03-151104-1c>

### Faster Digestion in Kangaroos Reduces Methane Emissions

(University of Zurich, November 05, 2015)

Animals produce methane during the digestion process – some more than others. Around 20 percent of the world's methane emissions, a greenhouse gas, stem from ruminants. Previous studies revealed that ruminants, which include cows and sheep, release more methane into the environment than kangaroos, for instance – even though the latter also possess a foregut, where bacteria break down the plant fibers and produce methane (much like in a cow's rumen). Researchers from Switzerland and Australia conclude that differences between species are more down to the conditions that the intestinal bacteria are exposed to than the exact type of these bacteria.

<http://swissinnovation.org/news/web/2015/03-151105-47>

### Using the Immune System to Fight Cancer

(University of Fribourg, November 05, 2015)

By acting on the immune system, researchers from the Department of Medicine at the University of Freiburg in collaboration with researchers at the Ludwig Maximilian University in Munich have succeeded in removing cancerous tumors. There are two ways to fight cancer: attack it directly, e.g. by targeting cancer cells with chemotherapy, or mobilize the immune system against tumors. The researchers investigated boosting the immune system, and their promising results could offer a therapeutic alternative within a few years. They started by identifying the immune system's defense mechanisms against infection; they then used substances that prevent the recruitment of regulatory T cells and thereby activated the immune system, inducing it to fight cancer cells. The findings are published in Cancer Research.

<http://swissinnovation.org/news/web/2015/03-151105-d3>

### Oral Iron Supplements Decrease Iron Absorption from Daily Doses

(ETH Zurich, November 06, 2015)

A new study recently published reveals that it may be difficult for the body to absorb iron in quantities that are necessary and desirable when the supplement doses are administered in 24-hour intervals. This may be due to a small, protein-like molecule with the name of hepcidin. As soon as iron enters the body, hepcidin production begins in the liver. This tiny protein, which is composed of just 25 amino acid building blocks, then is released into the bloodstream and reaches the intestine, where one of its functions is to regulate the amount of iron absorbed into the body through the cells of the gastrointestinal tract. A group of researchers working with Diego Moretti has shown how hepcidin inhibits the absorption of iron supplements in the intestine more profoundly than previously thought.



<http://swissinnovation.org/news/web/2015/03-151106-29>

### New Diabetes Center Opens

(Université de Genève, November 09, 2015)

For over 30 years, the study of diabetes has been one of the key research areas of the University of Geneva's (UNIGE) Faculty of Medicine. Diabetes is a major public health issue that affects nearly 500,000 people in Switzerland. UNIGE has just opened its new Diabetes Centre, which has established a formal network of experts and encourages all physicians and scientists working in Geneva on metabolic disorders to share their expertise. Centre members focus their research in several areas: metabolism, genetics, endocrinology, surgery or immunology. By facilitating the interaction among different research groups, the Centre aims to improve teaching, aid the development of preventive and therapeutic strategies, and encourage transversal research projects that lead to clinical applications.

<http://swissinnovation.org/news/web/2015/03-151109-38>



## Nanobodies Enable the Study of Organ Growth

(University of Basel, November 09, 2015)

Researchers at the Biozentrum of the University of Basel have developed a new technique using nanobodies. The two basic processes that control organ development are the regulation of growth and of the spatial pattern. The research group of Prof. Markus Affolter at the Biozentrum, University of Basel, has now developed a method named "Morphotrap" to study wing development in the fruit fly. Their results demonstrate that the signaling molecule Dpp, a so-called morphogen, influences growth in the center of the wing imaginal disc but not in the peripheral regions. It is the first time that an anti-GFP nanobody has been successfully employed in such an investigation. This tool also holds promise for future studies on organ development.

<http://swissinnovation.org/news/web/2015/03-151109-60>

## New Methods for Imaging Microwave Fields

(University of Basel, November 10, 2015)

Microwaves are important in several fields, but measuring them accurately has been a challenge. Two groups of researchers at the University of Basel have created complementary methods for measuring these fields without disturbing them. Both methods rely on measuring the spin property. One method uses a glass cell with rubidium vapor and measures the spin of these atoms. This allows a wide area to be measured quickly. The other method uses a diamond with a nitrogen vacancy center and measures electron spin in the vacancy. This method measures only one point in the field at a time, but is more accurate spatially. Together, the two methods could be used to create very accurate measurements.

<http://swissinnovation.org/news/web/2015/03-151110-52>

## Gaming Against Heart Disease in Diabetic Patients

(University of Basel, November 13, 2015)

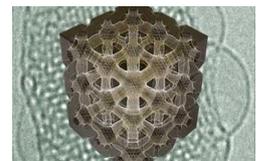
Regular physical activity can not only help to prevent diabetes but is also crucial in managing the disease in patients already affected in order to decrease their risk of cardiovascular diseases. In order to motivate elderly diabetic patients to become more physically active, a team of sports scientists led by sports physician Professor Arno Schmidt-Trucksäss from the Department of Sports, Exercise and Health at the University of Basel used the Nintendo Wii console. Wii Fit Plus exercises feature fluid movements, simple instructions and a low risk of injury. They are suitable for diabetes patients because the training intensity is self-adjusting based on the individual fitness level and the exertion level lies between 40 and 60 percent of the maximal exhaustion – an ideal level for type 2 diabetes patients.

<http://swissinnovation.org/news/web/2015/03-151113-04>

## New Drug Delivery Tool

(EPFL, November 17, 2015)

Cubosomes are small biological "capsules" that can deliver molecules of nutrients or drugs with high efficiency. They have a highly symmetrical interior made of tiny cubes of assembled fat molecules similar to the ones in cell membranes. This also means that cubosomes are safe to use in living organisms. Such features have triggered great interest in the pharmaceutical and food industry, who seek to exploit the structure of cubosomes for the controlled release of molecules, improving the delivery of nutrients and drugs. EPFL scientists, working with Nestlé, have now been able to study the 3D structure of cubosomes in detail for the first time.



<http://swissinnovation.org/news/web/2015/03-151117-bf>

## Freshwater Polyp Hydra Can Modify Its Genetic Program

(University of Geneva, November 18, 2015)

A champion of regeneration, the freshwater polyp Hydra is capable of reforming a complete individual from any fragment of its body. It is even able to remain alive when all its neurons have disappeared. Researchers at the University of Geneva have discovered how: cells of the epithelial type modify their genetic program by overexpressing a series of genes, among which some are involved in diverse nervous functions. Studying Hydra cellular plasticity may thus influence research in the context of neurodegenerative diseases.

<http://swissinnovation.org/news/web/2015/03-151118-b0>





## The Corn Snake Genome Sequenced for the First Time

(University of Geneva, November 24, 2015)

Among the 5 000 existing species of mammals, more than 100 have their genome sequenced, whereas the genomes of only 9 species of reptiles (among 10 000 species) are available to the scientific community. Genomics allows to better investigate the evolution of the living world. Describing the function of each gene should enable to understand how the snake lost its limbs or how various skin colorations have evolved. Unfortunately, reptiles are poorly represented in genomic databases. This is the reason why a team at the University of Geneva (UNIGE), has produced a large database including, among others, the newly-sequenced genome of the corn snake, a species increasingly used to understand the evolution of reptiles. Within the same laboratory, the researchers have discovered the exact mutation that causes albinism in that species, a result published in Scientific Reports.



<http://swissinnovation.org/news/web/2015/03-151124-e8>

## Common Cause for Complications After Kidney Transplantation Identified

(University of Basel, November 24, 2015)

Polyomavirus infections are common, however, they usually do not cause symptoms in healthy adults. However, the virus becomes much more problematic for patients who have to take immunosuppressive drugs after kidney transplantation. In ten to twenty percent of all cases, the BK virus starts to spread within the transplant and causes an inflammation. This can, in the worst case, destroy the new organ entirely and put the patient back on the transplant waiting list. A research group from the Department of Biomedicine at the University and the University Hospital of Basel has now been able to show, that the immunosuppressive drug Tacrolimus directly activates the replication of the virus and could thus be responsible for these complications.

<http://swissinnovation.org/news/web/2015/03-151124-c5>

## Novel Technology for Protein Delivery

(University of Basel, November 24, 2015)

Without proteins life would be unthinkable. They fulfill a diverse range of tasks and are often highly specialized. Proteins reproduce genetic material, transport substances and play an active role in the immune defense. In order to understand these pathways and processes of life in more detail, scientists rely on methods enabling the delivery of individual proteins into target cells. In collaboration with researchers at the Biozentrum, the team of Dr. Simon Ittig from the startup T3 Pharmaceuticals has developed a simple and powerful tool that allows the injection of a wide range of proteins into eukaryotic cells by using bacteria.

<http://swissinnovation.org/news/web/2015/03-151124-a5>

## A Role for Neural Noise in Animal Behavior

(EPFL, November 24, 2015)

Choices like when to walk or rest may be shaped in part by neural fluctuations. Neurons in the brain are never quiet. They are constantly producing and receiving signals – like background noise. The researchers studied the fruit fly, *Drosophila melanogaster* to determine the impact of noisy neural fluctuations on the timing of flies' walking behaviors. They recorded the behaviors of thousands of flies and tested if it was possible to mimic their largely unpredictable walking patterns using a computer simulation of networks of artificial neurons driven by random fluctuations. Their study showed that fluctuating neural signals were indeed required to reproduce fruit fly behaviors. Most surprisingly, by looking closely at these neural networks, they found that these signals did not simply disrupt neural activity, but could actually sculpt behavior in a meaningful way.



<http://swissinnovation.org/news/web/2015/03-151124-9b>

## Combined Antibody-Drug Compounds and Immunotherapy to Treat Breast Cancer

(University of Basel, November 26, 2015)

To more efficiently treat breast cancer, scientists have been researching molecules that selectively bind to cancer cells and deliver a substance that can kill the tumor cells. Researchers from the University and University Hospital Basel have now for the first time successfully combined such an antibody-drug conjugate with a therapy that stimulates the immune system to attack tumor cells. This opens the door to new therapeutic options in the treatment of breast cancer.

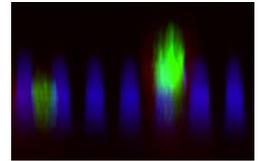
<http://swissinnovation.org/news/web/2015/03-151126-ca>



## Epithelial Cells Migrate to the Surface to Divide

(ETH Zurich, November 27, 2015)

In order to divide, cells undergo a process known as cell rounding, which allows the chromosomes to be copied and then to be incorporated into two daughter cells. Cell rounding is especially drastic and difficult for columnar cells that are stacked next to one another, for example the epithelial cells that form the lining of the intestines and other mucous membranes and vascular walls. These cells are similar to toothpicks in a box, tightly packed side by side with neighbouring cells. These cells have barely any space in the wall tissue to round up for cell division. Researchers at the ETH Zurich Department of Biosystems Science and Engineering in Basel have now uncovered the associated mechanism.



<http://swissinnovation.org/news/web/2015/03-151127-fe>

## 4. Nano / Micro Technology / Material Science

### Higher Quality and Cheaper Production of 2-Micron Lasers

(EPFL, October 12, 2015)

A team led by Camille Brès at the EPF Lausanne has developed an innovative method to produce 2-micron lasers by changing the way its optical fibres are connected to each other. In doing so, the researchers at the Photonics System Laboratory are now able to produce these lasers at lower costs with higher quality light outputs. Lasers of the 2-micron spectral domain remain relatively undeveloped as a field, but are potentially very important in the fields of medicine, environmental sciences, and industry. For example, because of the ability of water molecules to absorb light at this wavelength, high precision surgery may benefit immensely from this technology. Additionally, meteorological data over longer distances can be collected through air using these lasers, as well as the highly effective processing of various industrial materials.



<http://swissinnovation.org/news/web/2015/04-151012-80>

### Trampolining Water Droplets

(ETH Zurich, November 04, 2015)

Materials that actively repel water and ice very strongly are sought after by the aviation industry and for many other technical applications. ETH researchers placed a droplet measuring 1 mm in size on a specially treated rigid silicon surface and then continuously reducing the air pressure. At first, the drop rested motionless on the surface, but at around a twentieth of normal atmospheric pressure it suddenly jumped up. After a short leap the droplet eventually landed on the surface again, only to jump even higher than the first time. Just like on a trampoline the droplet was propelled higher after each contact with the completely rigid surface. The combination of natural water evaporation and the microstructure of the material's surface are essential for the trampolining phenomenon. The overpressure between the droplet and the surface, resulting from evaporation, launches the drop upwards at each impact, just like a spring would do.



<http://swissinnovation.org/news/web/2015/04-151104-4b>

### Transport of an Electron Through a Quantum Dot

(University of Basel, November 17, 2015)

Scientists from the Swiss Nanoscience Institute and the Department of Physics at the University of Basel have demonstrated for the first time how electrons are transported from a superconductor through a quantum dot into a metal with normal conductivity. On the basis of quantum mechanics, theories were developed in the nineties which indicated that the transport of Cooper pairs through a quantum dot is entirely possible under certain conditions. The prerequisite is that the second electron follows the first very quickly, namely within the time roughly stipulated by Heisenberg's uncertainty principle. The scientists at the University of Basel have now been able to accurately measure this phenomenon. In their experiments the scientists found the exact same discrete resonances that had been calculated theoretically.

<http://swissinnovation.org/news/web/2015/04-151117-9b>



## CO2-free Fuel Made from Renewable Electricity

(Empa, November 23, 2015)

Mobility is responsible for approximately 40 percent of Switzerland's CO2 emissions. These emissions can be reduced significantly if we switch to renewable energy as source of fuel. Plants have been using sunlight, water and CO2 to supply themselves sustainably with energy for millions of years. Empa's demonstration and technology platform "move" aims to reveal how this concept can be realized for individual mobility. Surplus electricity from photovoltaic plants or hydropower is converted into hydrogen in an electrolysis plant, compressed and stored in compressed gas containers. The hydrogen can then be used to refuel fuel cell vehicles directly or it is mixed with natural/biogas. Temporary storage of surplus solar power in a network battery to charge electric vehicles overnight is also in the pipeline. This large-scale project demonstrates the switch from fossil to renewable energy throughout the entire value-added chain, including efficient electric, hybrid, fuel cell and gas vehicles. "Only if the latest research results are also – quite literally – brought onto the roads can we prepare innovative and practical solutions in the mobility sector for the market," says Empa CEO Gian-Luca Bona. This is precisely where "move" comes in.

<http://swissinnovation.org/news/web/2015/04-151123-0c>

## Higher Efficiency Thanks to Perovskite Magic Crystal

(Empa, November 23, 2015)

Stacking two solar cells one over the other has advantages: Because the energy is "harvested" in two stages, and overall the sunlight can be converted to electricity more efficiently. Empa researchers have come up with a procedure that makes it possible to produce thin film tandem solar cells in which a thin perovskite layer is used. The processing of perovskite takes place at just 50 degrees Celsius and such a process is potentially applicable for low cost roll-to-roll production in future. The semi-transparent perovskite solar cell absorbs UV, blue and yellow visible light. It allows red light and infrared radiation to pass through. Based on this principle, a double-layer "tandem solar cell" can be built with an efficiency that is much higher than single-layer solar cells.

<http://swissinnovation.org/news/web/2015/04-151123-cb>



## New Form of Real Gold, Almost as Light as Air

(ETH Zurich, November 25, 2015)

Researchers at ETH Zurich have created a new type of foam made of real gold. It is the lightest form ever produced of the precious metal: a thousand times lighter than its conventional form. It's an aerogel that builds a three-dimensional mesh of gold that consists mostly of pores. The new material could be used in many of the applications where gold is currently being used. The substance's properties, including its lighter weight, smaller material requirement and porous structure, have their advantages. Applications in watches and jewellery are only one possibility. Another application demonstrated by the scientists is chemical catalysis: since the highly porous material has a huge surface, chemical reactions that depend on the presence of gold can be run in a very efficient manner. The material could also be used in applications where light is absorbed or reflected.

<http://swissinnovation.org/news/web/2015/04-151125-0b>



## 5. Information & Communications Technology

### Deep Learning Algorithm for Photo Captions

(EPFL, November 16, 2015)

Two researchers at Idiap, a research institute in Martigny that is affiliated with EPFL, developed an algorithm that – unlike systems recently unveiled by Google and Microsoft – can describe an image without having to pull up captions that it has already learned. To do this, the researchers used a program capable of making vector representations of images and captions based on an analysis of caption syntax. The technique has piqued the interest of social media. The two researchers did a six-month research internship at Facebook, which is drawing on their work to develop its own model of automatic captions meant in part for the visually impaired. The two researchers believe that their algorithm could be improved in the future through the use of more complex language models and by linking it to larger databases.

<http://swissinnovation.org/news/web/2015/05-151116-fb>

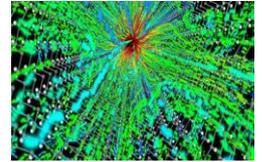




## High-Performance Computing Research at ETH Zurich

(ETH Zurich, November 20, 2015)

Two research groups from ETH Zurich competed in the finals for the Gordon Bell Prize. ETH professors Mathieu Luisier from the Institute for Integrated Systems and Joost VandeVondele, Head of the Nanoscale Simulations Group, combined two software programs and developed a new algorithm to maximise the throughput rate for hybrid computer systems consisting of conventional CPUs and graphic processors (GPUs). This enabled them not only to reduce the time taken to simulate nanoscale devices by fifty times, but also to increase the size of the nanocomponents to over 50,000 atoms. The second research team from ETH is led by ETH Professor Petros Koumoutsakos of the Computational Science & Engineering Laboratory (CSElab). In collaboration with researchers from elsewhere, the team used the Titan supercomputer to run state-of-the-art simulations of the flow of micron-sized red blood cells and tumour cells through microfluidic channels.



<http://swissinnovation.org/news/web/2015/05-151120-91>

## 6. Energy / Environment

### Psychological Responses to Climate Change

(University of Bern, October 12, 2015)

In order to engage society at large with respect to taking action to prevent climate change, emphasizing climate change's effects local to the population is often suggested. In many cases, this method of proximization seems logical; for example, a nature-lover who hikes or climbs would find the impending disappearance of the glaciers in the Swiss Alps a compelling motivator to change her consumption towards more sustainable habits. However, research newly published in Nature Climate Change by Dr. Adrian Bruegger and colleagues demonstrates that no, or even possibly negative effects of proximization can arise. For instance, threats brought about by climate change can overwhelm individuals to the point of inducing fear and disincentive to act. Their work is expected to open further avenues for policy research and inform future interventions for tackling climate change.

<http://swissinnovation.org/news/web/2015/06-151012-de>

### Bees Love Caffeine Too

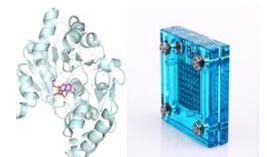
(CellPress, October 15, 2015)

Researchers at the University of Bern together with colleagues in the UK have recently published a study in the journal Current Biology showing that honey bees have a particular affinity for caffeinated nectar, even if the nectar is second-grade. According to the scientists, among them Roger Schürch of the University of Bern's Behavioural Ecology Department, plants therefore have a novel way of tricking honey bees into becoming their loyal foragers, thereby securing a means of pollination. The influence of caffeine on bees suggests that reward pathways in bees' brains play a role in their behaviour. The scientists now look forward to testing what other compounds plants may lace their nectar with in order to attract pollinators.

### How Hydrogen Processing Enzymes Work

(EPFL, November 02, 2015)

As the world moves progressively towards renewable energy sources, being able to store such energy is developing into a challenge. Storing energy in the form of hydrogen looks like a promising solution. Scientists are designing systems that will mimic enzymes called hydrogenases that process hydrogen in their energy metabolism. However, the way hydrogenases work is not very well understood. Scientists at EPFL and the Max Planck Institute have used synthetic molecules to decipher which parts of a hydrogenase are key to the reaction. Their work, which may greatly improve hydrogen processing is published in Nature Chemistry.



<http://swissinnovation.org/news/web/2015/06-151102-b7>

### Black Smokers Deep in the Sea

(Tages Anzeiger, November 02, 2015)

An international research team, including scientists from Eawag, has discovered an uncharted and unusually large hydrothermal vent field with several unusually large black smokers in the Gulf of California. This volcanic site is of particular interest for climate research. Following the breakup of continental crust, volcanic activity occurs on the seafloor. Magmatic rocks intrude into existing sediments, and pore water is heated to such an extent that large



amounts of carbon previously deposited with sediments are released. Carbon-rich water begins to rise to the surface, where gases including CO<sub>2</sub> are then released into the atmosphere. The size and activity of the system suggest that hydrothermal venting may indeed be of relevance for the global climate if it occurs on a large scale during seafloor spreading.

<http://swissinnovation.org/news/web/2015/06-151102-6c>

### Tackling a Disease with Math

(EPFL, November 11, 2015)

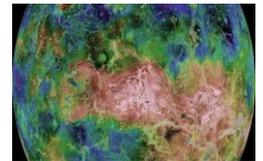
Schistosomiasis is a parasitic disease that is endemic in sub-Saharan Africa. While humanitarian projects have successfully brought down the number of victims, a group of researchers led by EPFL are currently developing a computer model to achieve a more ambitious aim: to completely eliminate the disease from the region. Thanks to this mathematical approach, some interesting conclusions regarding the role of human mobility and water resource development could already be drawn. This mathematical tool to eliminate the disease is only one of the latest facets in a 30-year collaboration between EPFL and the International Institute for Water and Environmental Engineering in Ouagadougou, Burkina Faso.

<http://swissinnovation.org/news/web/2015/06-151111-b4>

### Explanation for Reason of Plate Tectonics

(ETH Zurich, November 11, 2015)

It is common knowledge that the Earth's rigid upper layer called lithosphere is composed of moving plates. But just what mechanism first set plate tectonics into motion still remains a mystery. A team of researchers led by ETH professor Taras Gerya has now come up with one possible answer by using simulations. Among other things, he found inspiration in studies about the surface of the planet Venus. Gerya observed (and modelled) huge, crater-like circles (coronae) on Venus that may also have existed on the Earth's surface in the early period (Precambrian) of the Earth's history before plate tectonics even began. These structures could indicate that mantle plumes once rose from Venus' iron core to the outer layer, thus softening and weakening the planet's surface. Plumes form in the deep interior of the planet.



<http://swissinnovation.org/news/web/2015/06-151111-50>

### New ETH Professorship for Sustainable Food Processing

(ETH Zurich, November 13, 2015)

Bühler and Migros will give a total of five million Swiss francs to ETH Zurich to finance the professorship for Sustainable Food Processing. Additionally, post-doc research projects will receive funding within the framework of the ETH World Food System initiative. The newly created assistant-professorship for Sustainable Food Processing conducts research into the development of new methods of food processing to make food production more environmentally friendly and sustainable. To answer global challenges, ETH Zurich initiated the strategic "World Food System" project and founded the World Food System Center (WFSC) in 2011. This centre of competence links researchers and students from seven departments, including Agro- and Food Sciences. Those working at the centre are dedicated to finding solutions for the whole food value chains and thus contributing to sustainable food security.



<http://swissinnovation.org/news/web/2015/06-151113-fb>

### Plant Roots Shaped by River Fluctuations

(EPFL, November 18, 2015)

Whether due to climate change or changes in power production, rivers may see significant changes in the amount of water they carry. Changing flow rates can be disruptive to bushes and trees that grow on riverbanks. Now, researchers from EPFL have developed a way to predict how fluctuations in the water table impact the roots that nourish them. "Just above the water table, there is a layer of soil that is kept humid by capillary forces," says Stefania Tron, the lead author of the study. "When the depth of the water table fluctuates, roots that are within this humid layer grow, while those in the dry soil above it and those immersed in ground water below it may die off." The researchers developed a mathematical model that combines information on plant species, soil properties, and water table fluctuations to estimate the distribution of their roots underground. Besides studying the effect of natural and manmade changes to river flow rate on tree root density, Paolo Perona, the project's supervisor, says that it could also provide valuable information for river restoration projects. "Our model can provide





information on how deep the roots will grow, allowing to quantify to what extent they reinforce they soil of the riverbanks,” he says.

<http://swissinnovation.org/news/web/2015/06-151118-ae>

### Enterprises Spent CHF 2.3 Billion on Environmental Protection in 2013

(FSO, November 24, 2015)

In 2013, spending on environmental protection by enterprises amounted to approximately CHF 2.3 billion. Compared with 2009, investments in pollution prevention increased by 30% whereas investments in pollution treatment fell by 31%. This development, among other things, reflects enterprises' increased interest in cleaner production processes. These are some the results of a survey conducted by the Federal Statistical Office (FSO).

<http://swissinnovation.org/news/web/2015/06-151124-12>

### Smartphone App to Battle Crop Disease

(ETH Zurich, November 24, 2015)

Crop diseases, a major cause of famine, have always been diagnosed by visual inspection, though microscopes and DNA sequencing are also used today. But the first line of defense is still the keen eye of farmers around the world, many of which do not have access to advanced diagnostics and treatment advice. To address this problem, scientists from EPFL and Penn State University are releasing 50,000 open access images of infected and healthy crops. The images will allow machine-learning experts to develop algorithms that automatically diagnose the disease of a crop. The tool will then be put into the hands of farmers – in the form of a smartphone app.



<http://swissinnovation.org/news/web/2015/06-151124-59>

### Amoebas Could Play a Big Role in Climate

(EPFL, November 26, 2015)

The world's peatlands store tremendous amounts of carbon – up to 20 years' worth of human and natural emissions. While today they sequester more carbon than they release, research suggests that in a warmer world, they could decompose more quickly, reinforcing the vicious cycle of global warming by releasing additional CO<sub>2</sub> into the atmosphere. In a recent study, scientists have investigated one of the most predominant types of peatland microorganisms and how their response to higher temperatures could impact the uptake or release of carbon by peatlands. Peatlands are teeming with microorganisms – algae, bacteria, and others – with a wide range of feeding strategies. Because of their sheer abundance, these microorganisms may have it in them to push their habitat towards increased sequestration of atmospheric CO<sub>2</sub> in peatlands, or towards an increased release of the gas back into the atmosphere.

<http://swissinnovation.org/news/web/2015/06-151126-93>

### Measuring Air Pollution on a Bicycle

(EPFL, November 27, 2015)

Four EPFL microengineering students invented a bicycle-borne system to measure CO and NO<sub>2</sub> levels in the air thanks to a sensor in the casing of the bike light. Dubbed BeMap (Bicycle Environmental Mapping), this little system gauges air pollution levels throughout the bike ride and then transmits the data to a computer. The idea has merit, as the students captured second place at the international microengineering competition iCan held this past summer in Anchorage (Alaska). BeMap's main use is to help cyclists choose the route with the lowest level of vehicle exhaust. But the idea is also to put the air-pollution readings submitted by all users into an open-source database on the internet and use the data for purposes of environmental mapping. During any given bike ride, 500 to 1,000 pollution readings could be taken and then uploaded in real time via Bluetooth.



<http://swissinnovation.org/news/web/2015/06-151127-17>

## 7. Engineering / Robotics / Space

### Fast-Moving Structures Observed

(ETH Zurich, October 07, 2015)

Publishing in the prestigious journal Nature, researchers at ETH Zurich's Institute for Astronomy report observing five bow-like structures moving at some 40,000km per hour in the debris disk of the star AU Microscopii thanks to the capabilities of SPHERE. SPHERE is a newly installed instrument at the European Southern Observatory in



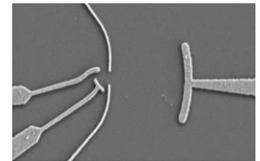
Chile that has enabled the clear resolution of the inner part of the disk for the first time. At first, the scientists had not expected to observe such well-defined structures at long range, but after reprocessing data collected by the Hubble Space Telescope five years ago to confirm their findings, the research team was even able to trace the evolution and trajectories of the bows. The researchers will continue to monitor the subsequent movement of the structures and hope to understand their spatial arrangement and chemical composition, citing the possibility of a previously undiscovered planet.

<http://swissinnovation.org/news/web/2015/07-151007-ef>

### Directing Electrons with a Resonator

(ETH Zurich, October 12, 2015)

It has been more than two thousand years since Archimedes devised a way using a curved mirror to reflect light and focus it into a point. In a similar way, researchers at ETH Zurich's National Centre of Competence in Research Quantum Science and Technology have now found a way to reflect and focus electrons. The special 'mirror' they have developed, called an electron resonator, is made of high quality materials produced in-house in the Wegscheider Laboratory for Advanced Semiconductor Quantum Materials which are a hundred times cleaner than the types of materials that could have been fabricated almost two decades ago, when the idea of focusing electrons was initially investigated. The researchers expect their work to have implications in the field of quantum computing and basic science.



<http://swissinnovation.org/news/web/2015/07-151012-d1>

### Swiss Satellite Software will Receive International Distribution by Solenix

(EPFL, October 26, 2015)

Solenix GmbH and EPFL have entered a license agreement that will allow Solenix to develop and market a satellite control system for nano and small satellites based on the SwissCube Satellite Control System (SCS). Private companies and universities are increasingly using CubeSats and other small satellites for commercial and technological demonstration purposes. This trend increases the need for a cost-effective, lightweight and flight-proven solution, such as the SwissCube SCS, capable of efficiently handling single-satellite missions, as well as constellations. An upgraded version of the SwissCube SCS is also the core of the solution proposed as baseline mission control system to the teams of the EU-funded QB50 project.

<http://swissinnovation.org/news/web/2015/07-151026-3e>

### Oxygen Detected on Comet Chury

(Le Temps, October 28, 2015)

The Rosetta space probe, built by the European Space Agency (ESA), has detected molecular oxygen on Comet 67P/Churyumov-Gerasimenko, which the probe has been orbiting since summer 2014. Scientists from the University of Bern, in charge of an instrument called Rosina installed on the Rosetta probe, are struggling to explain the oxygen's origin. Rosina is a kind of "nose" that analyzes the gases emitted by the ice core and dust which form the famous comet tails. Rosina weighs molecules to identify them. It has already detected water vapor, carbon monoxide and carbon dioxide, plus other nitrogen-, sulfur- and carbon-bearing compounds, and even noble gases. For the first time, however, it has sniffed oxygen in the vicinity of a comet. The findings are published in Nature.



<http://swissinnovation.org/news/web/2015/07-151028-82>

### Autonomous Bus in Development

(EPFL, November 04, 2015)

EPFL is working with partners to develop an autonomous shuttle bus for public transportation in Switzerland. This new technology promises to lower the cost of providing bus service in low population areas. The current effort is focused on fleet management, scheduling, and interaction with the operating environment. Tests with a real bus are planned for 2016, initially on a closed course and then on the streets of Sion, Switzerland, if all goes well. The bus would be limited to 20 km/h and the test would determine how viable this technology is.

<http://swissinnovation.org/news/web/2015/07-151104-b2>



## New Camera for Mars Mission

(University of Bern, November 08, 2015)

A team led by the University of Bern has developed an imaging sensor for a joint European and Russian mission to Mars. The sensor is called Colour and Stereo Surface Imaging System (CaSSIS) and is slated to fly on the ExoMars Trace Gas Orbiter. It is a high-resolution color camera system that reuses component designs from previous imagers for simplicity. To capture stereo images, it first looks ten degrees ahead of straight down along the orbiter's flight path. It then rotates 180 degrees and looks ten degrees behind, capturing the same area from the new perspective, thus requiring only one sensor to capture stereo imagery.

<http://swissinnovation.org/news/web/2015/07-151108-d6>

## Advanced Method for Detecting Short Circuits

(EPFL, November 10, 2015)

One problem facing power grid operators is detecting the location of short circuit faults, such as when a power line is downed by severe weather. The process typically involves physically checking suspected fault locations. Researchers at EPFL have developed a new method that analyzes the waveform measured on power lines at a substation. When a short circuit occurs, the waveform is disturbed. This waveform can be fed into a simulation of the power grid and reversed to pinpoint the location of the fault to great accuracy. In fact, the more complex the power grid is, the more accurate the result will be. As renewable power sources make our grids more complex, this technology becomes more important.

<http://swissinnovation.org/news/web/2015/07-151110-8f>

## Cyathlon 2016

(ETH Zurich, November 18, 2015)

The Cyathlon will be held on 8 October 2016 at the Swiss Arena in Kloten. 12 to 16 teams participate in each of the six different disciplines at the Cyathlon. There are courses with everyday challenges for people with powered leg prostheses, powered exoskeletons or powered wheelchairs, as well as an agility course for people with powered arm prostheses, a bike race with electric muscle stimulation and a brain-computer interface game (BCI) for quadriplegics. The participants in this unique competition are people with disabilities, aided by cutting-edge assistive technologies. The assistive technologies used in the competition are either products already available on the market, or prototypes from research labs. During this summer's practice session, the teams tested out the courses that have been designed to resemble everyday tasks.

<http://swissinnovation.org/news/web/2015/07-151118-44>



## LISA Pathfinder mission

(University of Zurich, November 26, 2015)

LISA Pathfinder is a satellite designed to help detect gravitational waves in space. UZH physicist Philippe Jetzer is involved at the forefront of this international experiment. In recent years the scientists have been working with technicians to design and build highly sensitive detection equipment, which they'll now be able to test as part of the satellite mission. The equipment must be able to put two test masses in a gravitational free-fall, and control and measure the tiniest changes in the distance between them. This will require a breathtaking degree of precision corresponding to a fraction of the size of an atomic nucleus, in the pico range (10 to the power of negative 12).

<http://swissinnovation.org/news/web/2015/07-151126-bf>



## Max Planck ETH Center for Learning Systems

(ETH Zurich, November 30, 2015)

Machines will become not just more intelligent in the future, but also more capable of learning. To promote research in this field, ETH Zurich and the Max Planck Society officially open the Max Planck ETH Center for Learning Systems. The scientists want to understand the theoretical principles of learning and how these can be applied to real machines. The researchers are hoping to use the insights gained from these fundamental studies to evolve methods of machine learning. Similar procedures are already used to detect statistical





regularities in large volumes of data. However, many of them are still limited to specific tasks. Methods used to accurately identify faces in images, for example, will not teach a robot how to handle difficult terrain. The learning capacity of humans, on the other hand, depends very little on the specific task.

<http://swissinnovation.org/news/web/2015/07-151130-e1>

## 8. Physics / Chemistry / Math

### Microwave Field Imaging Using Diamond and Vapor Cells

(University of Basel, November 10, 2015)

Researchers from the Swiss Nanoscience Institute and the Department of Physics at the University of Basel have independently developed two new methods for imaging microwave fields. Philipp Treutlein's group images the microwave fields using a thin glass cell filled with rubidium vapor. Professor Patrick Maletinsky's team measures the spin change of individual electrons in a nitrogen vacancy center in diamond in order to obtain an image of the microwaves' magnetic field. The two independently developed methods complement one another with regard to measurement speed and spatial resolution.

<http://swissinnovation.org/news/web/2015/08-151110-9e>

### New Detector for Dark Matter Inaugurated

(Universitt of Zurich, November 16, 2015)

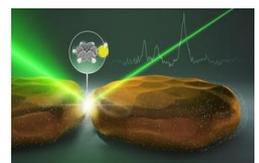
Despite intensive research, no direct evidence of dark matter has thus far been produced. To date, it has only been observed indirectly via its gravitational pull. The new XENON1T detector could represent a key step towards finding direct evidence. An international collaboration of 21 research groups launched the project, with researchers from the Universities of Zurich and Berne taking part. UZH Physics Professor Laura Baudis played a significant role in the development and construction of the world's most sensitive detector designed to search for dark matter. XENON1T was inaugurated in Italy – in a massive hall deep below the earth in the Gran Sasso Underground Laboratory. The detector is shielded there from disruptive cosmic rays by 1,400m of rock, and it is installed inside an enormous water tank to protect it from radiation.

<http://swissinnovation.org/news/web/2015/08-151116-cf>

### Surface-Enhanced Raman Scattering

(EPFL, November 23, 2015)

When it comes to studying single molecules, scientists use a powerful technique called "surface-enhanced Raman scattering" (SERS). An extremely sensitive tool, SERS detects the vibrations within the atoms of the illuminated molecule as a change in light color. But the sensitivity of SERS is limited at room temperature because molecules vibrate too weakly. EPFL scientists now show that this obstacle can be overcome with the tools of cavity optomechanics - the interaction between light and mechanical objects. The work has significant practical applications, as it can push the capabilities of SERS even further.

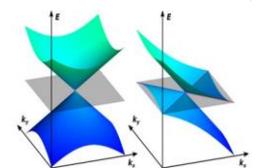


<http://swissinnovation.org/news/web/2015/08-151123-15>

### Surprising Discovery of a New Particle

(ETH Zurich, November 26, 2015)

Studying peculiar properties of a long known metallic material, researchers have chanced upon a new particle. It is related to the so-called Weyl fermions that the mathematician Hermann Weyl predicted almost ninety years ago. Weyl had overlooked the particle, which could have interesting applications in electronics. The researchers hit upon the new kind of particle when trying to understand strange physical properties of the metal tungsten ditelluride (WTe<sub>2</sub>). In order to simulate the physical properties of the metal crystals the researchers ran calculations for 200,000 hours on supercomputers at the Swiss National Supercomputing Centre CSCS and at the Chinese Academy of Sciences. It required weeks of calculations before the researchers came to the conclusion that they must have discovered something totally new: inside the tungsten ditelluride crystal there had to exist a thus far unknown type of fermion, the type-2 Weyl fermion.



<http://swissinnovation.org/news/web/2015/08-151126-a7>



## 9. Architecture / Design

### Innovations in Architecture: 3D Printing

(ETH Zurich, October 05, 2015)

Rock Print is a 4-metre high monolith currently on exhibition at the Chicago Architecture Biennial that typifies its theme, 'State of the Art Architecture'. Replete with elegant contours in a geometrically complex construction and yet only composed of seemingly mundane materials – rocks and string – Rock Print is the creation of researchers at ETH Zurich and MIT that represents a proof of concept: that robotic fabrication technology can be applied to a full-scale architectural project. New possibilities of design and resource efficient additive building principles make 3D printing technology attractive for the future of architecture, and though we are far from using this technique to achieve full-scale building projects, a transformation of our building environment and culture may be on its way.



<http://swissinnovation.org/news/web/2015/09-151005-84>

### The Future of Mobility in Switzerland

(University of St.Gallen, November 05, 2015)

As people travel greater distances across Switzerland on a regular basis, it is hardly a surprise that both public transport and road networks are congested at peak times. "A good transport system, however, is just as important to society as blood vessels are to an organism," says Ulrich Weidmann, Professor at the ETH Zurich Institute for Transport Planning and Systems. Together with around 20 partners from the mobility sector, researchers from ETH Zurich and the University of St.Gallen (HSG) developed a vision for the future of mobility in Switzerland. Only the outside appearance of the transport system will be the same in 2050. Experts expect the processes to be increasingly more automated. On the contrary, the scientists recommend that underused infrastructures should be decommissioned and dismantled.

<http://swissinnovation.org/news/web/2015/09-151105-49>

### Thin Walls with Potentially Fatal Consequences

(EPFL, November 06, 2015)

Given the choice between safer and cheaper construction, many housing design companies in earthquake-prone developing countries such as Chile or Colombia see themselves forced to save on expensive construction materials and opt for the cheaper design. EPFL structural engineers have gathered new data on how these structures respond to earthquakes, and in which circumstances they may fail. EPFL researchers together with their Colombian partners recently received a second round of funding to further improve the understanding of the structural behaviour of these structures as well as to study cost-effective approaches capable of stabilizing existing thin-walled reinforced concrete structures.



<http://swissinnovation.org/news/web/2015/09-151106-d8>

### Vertical Forest to Be Built in Switzerland

(Global Construction Review, November 11, 2015)

Stefano Boeri Architetti's two "vertical forest" towers began to grow in Milan last year, and now a sister project is to be built in Lausanne, Switzerland. The Tower of Cedars will house 24,000 plants on 3,000 square metres, including 100 cedar trees, 18,000 perennial plants and 6,000 shrubs. Stefano Boeri said: "The Tower of Cedars, thanks to its shapes and colour changing during the seasons, will become a landmark in the landscape of Lake Geneva." As well as their visual impact, the Milanese architect says the plants improve the environment inside the building by reducing noise and air pollution and helping to regulate its temperature.



<http://swissinnovation.org/news/web/2015/09-151111-e2>

## 10. Economy, Social Sciences & Humanities

### Chronic Pain Linked to Mental Disorders

(University of Basel, October 08, 2015)

In a study published in the Journal of Pain, Dr. Marion Tegethoff together with her team of researchers at the University of Basel's Faculty of Psychology have found that chronic pain and one or more mental disorders co-occurred in 25% of the approximately 6500 adolescents in their study. The mental disorders, ranging from affective



disorders, to anxiety, behavioural, and substance-induced disorders, were found to precede the onset of chronic pain, but not vice versa. This temporal association of mental disorder and chronic pain indicates that those affected by these disorders could be at risk for chronic pain in the future. The researchers hope to further their work by exploring the underlying biological and psychological mechanisms in order to develop integrative, interdisciplinary approaches to prevention and treatment.

<http://swissinnovation.org/news/web/2015/10-151008-e9>

### **Trains on Four Continents: Mobility, Societal Perception, Economics**

(University of Basel, October 19, 2015)

In the international research project 'imagineTrains', questions range from the fundamental ('What is a train?') to the visionary ('For what purpose will trains be used in 50 years' time and by whom?'). Headed by Professor Max Bergman of the Social Research and Methodology Group at the University of Basel, the project studies the implications of rail mobility in China, France, India, South Africa, and the US on society, including how investment and job creation are affected by the presence of train networks. Understanding how the media and politics affect and are affected by train routes and travel are also key aspects of their research. The project is aimed towards delivering policy-relevant findings and remains as a form of academic research, thereby introducing an element of zeitgeist to university research so commonly found amongst decision-makers in politics and the economy.

<http://swissinnovation.org/news/web/2015/10-151019-d3>

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

### **R&D personnel in Switzerland has increased**

(SBFI, November 19, 2015)

In Switzerland, the number of persons employed in R&D has increased by 44% in 12 years. In 2012, 63% of this personnel was concentrated in the business enterprise sector. R&D personnel can be broken down into three categories on the basis of the occupations carried out: researchers, technicians and support staff. In 2012, the greatest share of R&D personnel were researchers at 48%. Foreign researchers represent an ever greater share of researchers in Switzerland. In 2012, they constituted almost half of this category (49%). Few researchers are women. In 2012, they formed 32% of personnel. However, their numbers are fast increasing, at a higher rate than that of men. In 12 years, their numbers have more than doubled. In international comparison, the percentage of R&D personnel among the Swiss labour force was relatively high, placing Switzerland in the top group of OECD countries. However, Switzerland's position is weaker in terms of numbers of researchers.

## **12. General Interest**

### **Who Commutes Has Fewer Children**

(20min, November 06, 2015)

A long commute affects private life. It can destroy relationships or block the family planning. Nowadays, more and more people travel long distances to work. Half of the working population in Europe commute longer than two hours daily or spends more than 60 nights per year away from home for working reasons. Social scientist at EPFL conducted a survey with 7000 employees who have to commute long-distances. They found that stress resulting from commuting also affects people's private life. Couples are more likely to break up or they find it impossible to have a child under such stressful life conditions.

<http://swissinnovation.org/news/web/2015/12-151106-b4>

## **13. Calls for Grants/Awards**

### **Online Submission of Research Projects on Human Material and Data**

(Swissethics, October 06, 2015)

The online-platform BASEC (Business Administration System for Ethics Committees) to submit research project to Swiss Ethics Committees will be opened shortly. This document offers answers to frequently asked questions



related to the introduction of BASEC. Logins can already be created, the submission form will be available on Monday, October 26 2015, and the submission function will be activated on November 2nd 2015. As of January 1st 2016 the online-submission is mandatory and replaces all former submission methods (paper, CD, other storage devices).

<http://swissinnovation.org/news/web/2015/13-151006-89>

### Summer Undergraduate Research Programme on Biology

(UNIL, November 09, 2015)

This English-taught 8-week programme (July 4th to August 26th, 2016) aims at introducing Bachelor-level students to the world of biological and biomedical research: Individual students will be each integrated in a different experimental research laboratory of the School of Biology. This 7th edition of the SUR Programme will host around 20 participants from all over the world, including a couple of local students. A full scholarship toward tuition costs, living expenses and justified travel costs will be awarded to all selected participants. Application deadline: January 31st, 2016.

<http://swissinnovation.org/news/web/2015/13-151109-00>



### Upcoming Science and Technology Related Events

#### swissnex Day 2015

December 15, 2015

<http://www.swissnexboston.org/event/swissnex-day-2015>

Big data

Fribourg

#### Micronarc Alpine Meeting

January 31 – February 2, 2016

<http://mam2016.ch/>

Nano Technology

Villars-sur-Ollon

#### Innovative Nanomaterials for Medtech and Life Sciences

January 21, 2016

<http://www.i-net.ch/events/>

Nano Technology

Basel

#### LS<sup>2</sup> Annual Meeting 2016

February 15-16, 2016

<http://ls2-annual-meeting.ch/>

Interdisciplinary Sciences

Lausanne

---

#### Disclaimer

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