

# X-Letter

# 17

## SYSTEMSX.CH MEETS EU

In Brussels, SystemsX.ch met Robert Jan-Smits, research director of the EU.

02

## HOW WE TAKE DECISIONS

«Neurochoice» wants to discover how mice and men make their decisions.

04

## KEYSTONE MEETING

SystemsX.ch scientists at Keystone Symposium in Breckenridge.

06



19 Research, Technology and Development projects have been proposed.

Photo Christian Flierl

## Second Call generates 57 Proposals for SystemsX.ch Projects

Thomas Müller  
**Zurich.** The Second Call for SystemsX.ch projects resulted in 57 proposals, 25 less than last year. The deadline was midnight January 15, 2009.

19 Research, Technology and Development (RTD) Project proposals from eight different hosting institutions were submitted. For this Call, SystemsX.ch plans to fund about five to six RTD projects with up to 28 Million Swiss francs. The institutions of the supported scientists will be required to contribute at least the same amount, summing up to a total resource volume for research of about 60 mil-

lion Swiss francs. This round of research promotion focuses on the development of new technologies for Systems Biology and on projects at the interfaces of biomedical research, as well as genomics.

In addition, 22 proposals for Interdisciplinary PhD Projects (IPhD) and 16 applications for Interdisciplinary Pilot Projects (IPP) were submitted. A variety of the SystemsX.ch partner institutions, as well as the Systems Biology disciplines are represented.

Proposals for RTDs and IPhDs are evaluated by an international review panel of

continued on page 2

## Charles Darwin and Albert Einstein

Thomas Müller, head of communication



Charles Darwin is known to be one of the most important scientist of all times. In 2009 we celebrate the 200th anniversary of his birth, and for this reason we will present some of his citations in the X-Letters throughout the year. After Darwin, only Albert Einstein reached similar prominence. Below is a small comparison between the two geniuses.

Darwin assessed a huge amount of data through which he concluded the variation and selection principles allowing evolution. He was conscious that his discoveries would displease mankind. This was one reason he delayed the publication of his theory.

Einstein, on the other hand, did not discover principles, but elaborated on them. The special relativity theory is based on a single assumption and one measurement: physical laws are valid everywhere, and: the speed of light is finite. As a result, Einstein revolutionized the notion of time and space. Furthermore, Einstein's discoveries had a serious consequence. The atomic bomb was developed by applying his special theory of relativity and his famous formula  $E=mc^2$ .

continuation from page 1  
the Swiss National Science Foundation, whereas IPPs are subject to approval by the SystemsX.ch's Scientific Executive Board.

### Start in Summer

A preliminary decision about the approval of projects will be made in the beginning of May 2009. Subsequently, the SystemsX.ch Board of Directors will meet to make final decisions on the RTD-projects based on the commitments about each institution's own contributions. The final approval of all RTD-, IPhD-, and IPP-projects will hence be given by the end of June. The approved projects are expected to start in the second half of 2009.

### SystemsX.ch's Scientists portrayed

**Zurich.** The book and short film «SCIENCEsuisse» take us into the fascinating World of Science. Twenty five researchers from different disciplines are portrayed, offering us a broad view of the science platform in Switzerland. SystemsX.ch's members, Denis Duboule, Laurent Keller and ex-member Susan Gasser are among the portrayed scientists. thm

[www.sf.tv/sf1/sciencesuisse/index.php](http://www.sf.tv/sf1/sciencesuisse/index.php)

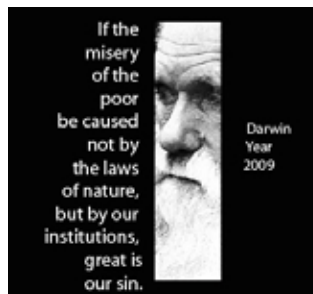
## SystemsX.ch introduced to the EU Commission in Brussels



Ruedi Aebersold, Daniel Vonder Mühl and Robert-Jan Smits of the Commission in Brussels.

Photo: SwissCore

**Brussels.** Robert-Jan Smits, director of the Research General Management of the European Commission, recognizes similarities between the set up of research initiatives in Switzerland and the EU. Since both Switzerland and the EU function under federal systems, one could compare the «Joint Programming» of the EU with the Swiss Program structure. This discussion took place in a briefing at SwissCore, the Swiss office for Science in Brussels, where SystemsX.ch was introduced by the Chairman of the Scientific Executive



Board, Prof. Ruedi Aebersold and its Managing Director, Dr. Daniel Vonder Mühl. Robert-Jan Smits presented the European coordination initiative for national Systems Biology programs (ERA-net Erasysbio).

In regards to the industry participation, the speakers see these kind of initiatives as a strategy to attract contribution money into those research areas hardly invested in by the industry due to market volatility.

Financing propelled by federal programs could help to develop a market potential in specific fields. SystemsX.ch also strives for a closer involvement with the industry.

\*Thomas Marty is the European consultant at SwissCore.

## Systems Biology at the «Café Scientifique»

**Basel.** Recently, one of the sessions of the «Café Scientifique» in Basel was dedicated to Systems Biology. Speakers of the event, as stated by Marcel Falk in the Science Journalism Blog «science-sofa», were some of the SystemsX.ch researchers, including Prof. Ernst Hafen from the Institute of Molecular Systems Biology from the ETH Zurich, Prof. Susan Gasser, ex-member of the SystemsX.ch Scientific Executive Board and Director of the Friedrich Miescher

Institute in Basel, as well as Prof. Markus Affolter from the Biozentrum of the University of Basel.

«We want to simulate life inside the computer», this is how Prof. Hafen describes the objective of systems biologists. In order to do that we must understand the operating system of life, which luckily is a more reliable operating system than Windows. According to Prof. Gasser, it is about turning descriptive biology into some kind of

engineering biology. The most striking definition comes from Prof. Affolter: «Systems Biology is the sum of all possibilities to understand life». What interests him is how a three dimensional form can emerge from a linear genome code. When asked by the public if living creatures are machines, what remains of the long explanations was: In reality yes, only very complicated machines, capable of reproducing themselves. thm

See also: <http://www.sciencesofa.info/>

## Peter Kunszt named Project Manager for IT-Backbone of SystemsX.ch



Peter Kunszt: the data guru.

**Zurich.** Peter Kunszt will be the new Project Manager for SyBIT, the SystemsX.ch IT-Backbone. This challenging position focuses on building with adequate hardware and software support a coherent IT storage universe

that is able to integrate the data gathered from the various SystemsX.ch projects. Managing and leveraging the data, and coordinating the specific needs across the various projects and SystemsX.ch institutions in Switzerland constitutes the biggest challenge in Peter Kunszt's new role.

Kunszt has several years of experience in leading application and service development projects and in providing support for operations in complex distributed infrastructures. From 2001 to 2006, he was a staff member at CERN in Geneva. Since February 2006 Kunszt has been working at the

CSCS, the Swiss National Supercomputing Center in Manno, Ticino. Kunszt's background in physics, mathematics, and chemistry (from the University of Bern) offers him the necessary exposure to interdisciplinarity.

Additionally, the languages he masters (German, Hungarian, English, French, Italian, and Spanish) represent an asset in this function, where interpersonal communication skills in diverse linguistic and cultural geographies are as important as Information Technology excellence. Peter Kunszt will be based at the SystemsX.ch Management Office in Zurich. NET

## PRAISE AND HONORS

### Ernst Fehr

**Zurich.** The economist Ernst Fehr from the University of Zurich received the Benoist-Prize 2008 in the value of 100'000 Swiss francs. Ernst Fehr (SystemsX.ch Project «Neurochoice») has been awarded for bringing to evidence that the decision-making behavior on economic matters in humans does not follow self-sufficient interests, but rather ponders on justice and mutual benefit. thm

### Michael Hall

**Basel.** Michael N. Hall, Professor for Biochemistry at the Biozentrum of the University of Basel received the Louis-Jeantet-Prize for Medicine 2009. The Louis-Jeantet-Foundation honors Hall (Project «YeastX») for his research on the fundamental mechanisms in cell growth. thm

### Philipp Gerber

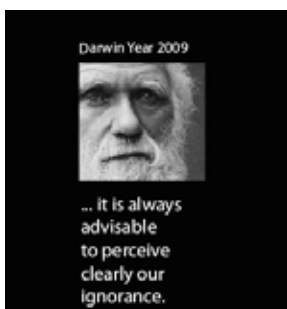
**Zurich.** Philipp Gerber, postdoc in the groups of Wilhelm Krek and Giatgen Spinas («LiverX»), received the Servier Forschungspreis (Servier Research Prize) 2008 from the Swiss Society for Endocrinology and Diabetology for his clinical research on islet transplantation. thm

### Thomas Müller stays at SystemsX.ch

**Zurich.** Until further notice, Thomas Müller will maintain his 20 percent assignment as the head of communications of SystemsX.ch. The Neue Zürcher Zeitung decided to recall the position they had offered him as the head of the scientific section shortly before he could assume office on January 1st. The reason given for the withdrawal was the massive advertisement collapse since October 2008. thm

## Mainly Positive Survey Results

**Zurich.** The SystemsX.ch communication team would like to thank those who responded to the survey, and offer you a summary of the results. Overall the response was positive, with the majority of responders satisfied with the Website and the X-Letter. Some readers criticized the French translation of the X-Letter. To tackle this problem we have changed translation office, and hope that our French readers will find the new translation up to their linguistic expectation. NET



## New members of the SystemsX.ch Scientific Executive Board elected



Melody Swartz and Mihaela Zavolan

**Zurich.** The Board of Directors approved Prof. Mihaela Zavolan and Prof. Melody Swartz as new members of the Scientific Executive Board.

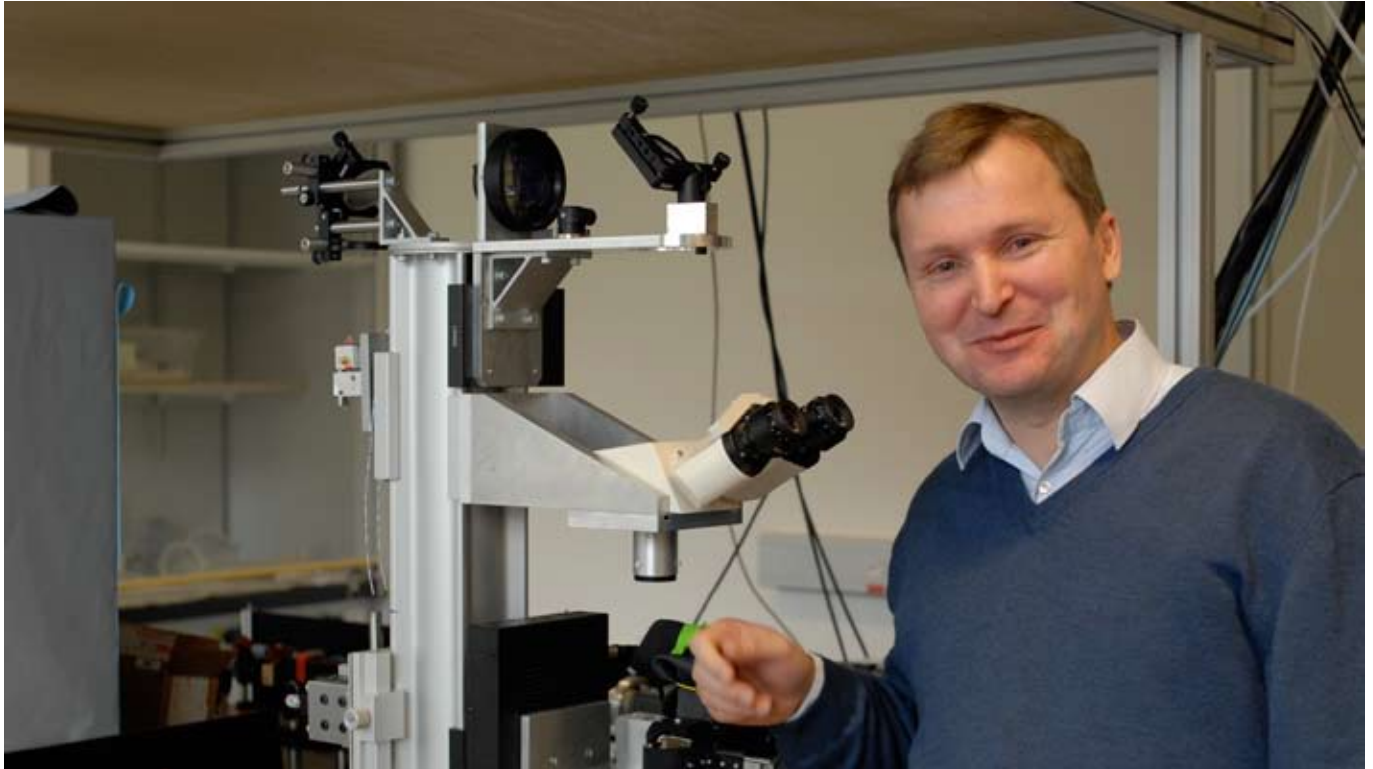
**Melody Swartz** is Associate Professor in the Institutes of Bioengineering and Chemistry & Chemical Engineering at the EPF Lausanne. Her research concentrates on lymphatic bioengineering, integrating physiology, transport functions, and biology of the lymphatic system with interdisciplinary approaches. The two key foci areas are cancer metastasis and immune cell trafficking,

Swartz has been a professor at EPFL since 2003. She will replace Prof. Demetri Psaltis of EPF Lausanne in the SEB.

**Mihaela Zavolan** is Associate Professor in the Computational and Systems Biology Core Program of the Biozentrum, University of Basel, and she leads a group at the Swiss Institute of Bioinformatics SIB-ISB. Through a combination of computational and experimental approaches, her group aims to understand the impact of miRNAs and RNA-binding proteins on the expression of target genes. These factors have been shown to play important roles in cell division and differentiation, development, metabolism, and immune responses. She will replace Prof. Susan Gasser from the Friedrich Miescher Institute in Basel who served on the Scientific Executive Board. AK

## Humans and Brains decide collectively.

The project «Neurochoice» searches for decision patterns all the way from synapses to financial experts.



Project leader Fritjof Helmchen is building a laboratory with microscopes capable of showing decision-making processes in mice brains.

Photo thm

Thomas Müller  
**Zurich.** The current financial crisis was, and continues to be, the consequence of a collective shortcoming of brokers and managers positioned at different stages in a commercialization chain and who repeatedly took the same decisions. Most likely, the financial crisis will continue to keep economists busy for years, if not decades. However, they are not alone this time. In SystemsX.ch, biologists, economists, physicians and mathematicians work together to find the neuronal correlates responsible for collective decision-making. «Neurochoice» is the title of the ambitious research project launched last fall by nine research groups at five Universities.

«Yes, one can expect to find evidence that the decision-making pattern leading to a financial crisis is represented in the brain.», says Professor Fritjof Helmchen from the Brain Research Institute of the University of Zurich. Physicist and physician

Helmchen heads «Neurochoice» and – months before the financial crisis erupted – joined forces with Professor Ernst Fehr, Director of the University's Institute for Empirical Research in Economics. Fehr is a co-founder of the discipline neuroeconomics and has been studying the neurobiological fundamentals of individual decision-making and social behavior for over ten years.

### Are humans overtaxed?

It is known that humans use the same brain areas to assess expected reward as to rely on sensorial perception and to gauge potential risk. From an evolutionary point of view, new financial risks differ gravely from the traditional perception-risks, therefore it is questionable if humans are well equipped to judge financial risks properly, or if they are fundamentally overtaxed.

«To answer questions like this, we plan to do experiments with mice and men, which we can compare to

each other.», says Helmchen. Behind this idea lingers the hypothesis that, although mice and men make very different decisions, those decisions take place in the same or at least similar brain structures.

Typically, various brain areas work together to make a decision and take an act of volition. A network of thousands of neurons clarifies each aspect of the decision – for example, the risk calculation. Neurons are, to some extent, network processors connected with thousands of other neurons. These connection junctions, called synapses, represent the elementary layer of the brain structure and function. What stands out on closer examination of the decision-making layers: the work is always done collectively.

### The origin of addiction

The synaptic clefts at a specific region of the middle brain is the scope of an additional part of the socially relevant project «Neurochoice». In order to gain a short-term reward, drug

addicts hazard the consequences of long-term damages. Christian Lüscher, Professor at the Department of Basic Neurosciences of the University of Geneva wants to discover how does «addiction» manifest itself in the brain. Among other things, he wants to examine the behavior of mice under the effect of cocaine when weighing between a small, short-term reward and a large, long-term reward. The same mechanism applies for various other drugs, such as nicotine, alcohol, marijuana, amphetamine and opium.

The group of Walter Senn, Professor for Computational Neuroscience at

the University of Bern, will try to describe the biochemistry of substance abusing behavior through mathematical models. Thus, addiction can either be an exaggerated valuation of a small, short-term kick, or a suppression of a larger, long-term damage. Which mechanism is at stake, from a brain physiology point of view, is still controversial. Nevertheless, Senn's mathematical models could determine which brain signals need to be observed during experiments to differentiate between the alternative decisions. As for the remaining decision-making layers, Senn's group will try

to find respective models. It would be interesting to know if such patterns also appear in decisions which are commonly not considered to be related to addiction – such as, for example, society's «indulgence» in fossil fuels consumption in the view of the global climate problem.

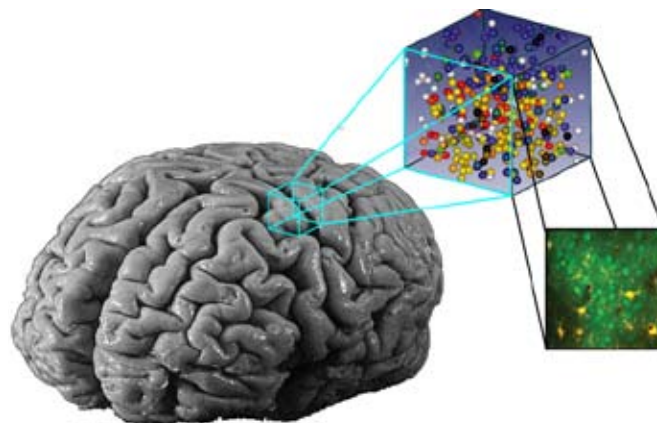
This line of reasoning is, no doubt, a long stretch; nevertheless it is a realistic stretch. The researches of «Neurochoice» are convinced that similar decision-making principles exist in the various layers – from the synapses to the social groups. Helmchen: «We want to discover these principles.»

## Filming the brain during decision making

Brain researchers use functional magnetic resonance imaging (fMRI) to observe the brain during activity. Depending on the task, a specific brain area lights up, allowing a map to be drawn of the activated brain regions.

Through the use of fMRI, the neuroeconomists of «Neurochoice» will examine the interaction between different brain areas during decision-making processes. However, the neuronal networks located inside a single brain area are more difficult to observe.

In this regard, «Neurochoice» will do pioneering work. By using electrophysiological and



Cube: the network activity of some hundreds of brain cells is measured in the rate of 10 times per second with the help Square: Dyed neurons and astrocytes

Graphic art NET

optical methods, they will uncover the activity patterns of networks in networks of mice and rats dur-

ing decision-making.

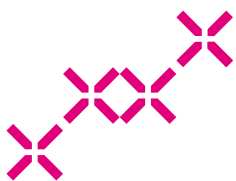
A combination of a laser sampling procedure and a sophisticated dyeing tech-

nique is applied to differentiate neurons from other brain cells. In doing so, the group of Fritjof Helmchen will succeed, for the first time worldwide, in depicting the activity of hundreds of neurons in a three dimensional and real-time manner (10 images per second).

During the «Neurochoice» term, the amount of observed neurons will increase, and the image rate will raise to 100 images per second.

Furthermore, an endoscopic miniature microscope, which allows animals to move freely while carrying it on their heads, will be adopted. thm

### «Neurochoice» – Neuronal Correlates of Collective Decision Making» at a glance



**Neurochoice**  
Neural Correlates of  
Collective Decision Making

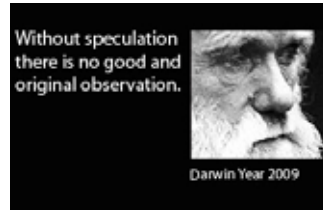
Head	Prof. Fritjof Helmchen, Brain Research Institute, University of Zurich
Involved research groups	Institute for Empirical Research in Economics, University of Zurich; Institute of Pharmacology and Toxicology, University of Zurich; Department of Physiology, University of Bern; Swiss Finance Institute; Brain Mind Institute, EPF Lausanne; Department Basic Neurosciences, University of Geneva.
Number of research groups	18
Researchers : Administration	30:2
Biologist : Non-biologists	3:1
Overall Budget (2008-2011)	14'778'900 Fr., from which SystemsX.ch 5'395'900 Fr.

## SystemsX.ch at Keystone Symposium

**Breckenridge.** Leading scientists of various disciplines came together at a Keystone Symposia end of January in Breckenridge (USA) to discuss research strategies and approaches using the -omics technologies available to Systems Biology. Several members of SystemsX.ch were among the approximately 200 international participants and presented their current research projects to the community.

Prof. Ruedi Aebersold from ETH Zurich, scientific co-organizer and speaker at the conference, later summarized that many cell biology projects greatly benefit by including -omics approaches. He also mentioned that many emerging new screening and high-

throughput methods profit from recently established high quality databases and reliable informatics work flows. Furthermore, he pointed out that research is moving towards structures and functional analysis on a whole network level. Prof.



Uwe Sauer (ETHZ) presented a project about condition-specific networks of active metabolic regulation. It aims at unravelling the transcriptional regulation processes that control the distribution of metabolic

fluxes in bakers yeast.

Prof. Ernst Hafen (ETHZ) nicely showed how large-scale mutation screens of drosophila flies with big and small heads are used to find specific genes that are involved in cell growth. The quality of the screen was demonstrated by successful follow up studies on selected targets. Finally, Prof. Pelkmans demonstrated the potential of image based RNAi screens to define cell phenotypes and to obtain clues about virus infection and endocytosis. Moreover, Prof. Christian von Mering (University of Zurich) presented the public available «Sting» database that allows every researcher to learn about protein-protein interactions and their functions.

Alexander Schmidt & Thomas Bock.

### Key to future medical breakthroughs is Systems Biology, say European scientists

**Strasbourg.** Crucial breakthroughs in the treatment of many common diseases, such as diabetes and Parkinson's, could be achieved by harnessing a powerful scientific approach called Systems Biology, according to leading scientists from across Europe. In a science policy briefing released by the European Science Foundation, the scientists pro-

vide a detailed strategy for the application of Systems Biology to medical research in the coming years.

This could lead to significant advances in the treatment of disease and help with the shrinking pipeline of pharmaceutical companies using traditional reductionist approaches to drug discovery.

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For more information: [www.esf.org](http://www.esf.org)

### Young Bioinformatician Awards

**Lausanne.** The Swiss Institute of Bioinformatics has launched the SIB 2009 Young Bioinformatician Awards. The prizes, assigned to young scientists in bioinformatics, consist of two categories: The SIB 2009 Young Bioinformatician Award and the SIB 2009 Best Graduate Paper. Closing date for entries is April 30, 2009.

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For more information: [www.isb-sib.ch](http://www.isb-sib.ch).

### Conferences und Events

March 23 - 25, 2009	Synthetic Biology, Systems Biology and Bioinformatics	Cambridge, UK
April 16 - 19, 2009	The 3rd International Biocuration Conference	Berlin
April 19-20, 2009	Molecular Systems Biology of the Cell	ISB, Seattle, USA
June 10-12, 2009	Computational Systems Biology, WCSB 2009	Århus, Denmark
June 18-19, 2009	Systems Biology of Human Disease 2009	Boston, MA,
Aug 09 - 12, 2009	Foundations of Systems Biology in Engineering	Denver, USA
Aug 30-Sep 4, 2009	10th International Conference on Systems Biology	Stanford, USA
Sep 16-18, 2009	4th International Conf. on Computational Bioengineering	Bertinoro, Italy
Nov 18, 2009	All-SystemsX.ch-Day 2009	Bern
Dec 11-12, 2009	Latest Advances in Drug Discovery Modelling & Informatics	Hyderabad

### The Glossary of SystemsX.ch

**Research, Technology and Development Project (RTD project):**  
SystemsX.ch's flagship project, multi-year duration.

**Interdisciplinary Pilot Project (IPP):**  
Research involving risks. One-year duration.

**Interdisciplinary Doctorate (IPhD):**  
Duration of 3 to 4 years.

**Board of Directors (BoD):**  
SystemsX.ch's highest steering body composed of the presidents, rectors and directors of all participating institutions.

**Scientific Executive Board (SEB):**  
Operative committee composed of scientists from the participating institutions.



**SystemsX.ch**  
The Swiss Initiative in Systems Biology

### IMPRESSUM

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