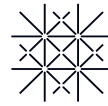




Universität  
Zürich <sup>UZH</sup>

**ETH** zürich



Universität  
Basel

# PlantScience*News*

Newsletter of the Zurich-Basel Plant Science Center

No 31, Spring 2017

## Upcoming Events

**IDP BRIDGES – Final Event  
Bridging Science and Policy**

5 Apr 2017, University of Zurich

**PSC Summer School – Understanding  
Risks and Resilience in Plant Systems**

29 May - 2 Jun 2017, Einsiedeln

**PSC Syngenta Symposium  
Modeling in Agriculture**

30 Aug 2017, Stein



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**Cover picture**  
Predicting the speed of biological invasions and native species migrations requires an understanding of the ecological and evolutionary dynamics of spreading populations. The picture shows seeds falling in experimental populations of *Arabidopsis thaliana*. © Frida Feijen

# Editorial

## How predictive can science be?

Revealing the unknown has been a traditional contribution of science, yet increasingly, modeling is being relied upon to predict the future. Many of the PSC members engage in ecological predictability research using experiments and models. This research takes us into the realm of complexity, in which properties and the behavior of a system are not determined by its parts, but by their interactions. Thus, forecasts of ecological dynamics in changing landscapes are available for variables, such as species abundance and distribution, community structure, and ecosystem processes.

Modeling is an essential tool in agricultural systems science, too. During the past decade, the application of agricultural production modeling has rapidly expanded. For example, by incorporating new capabilities enabling the analysis of soil carbon changes, pests and disease losses, and climate change mitigation and adaptation. The next generation of agricultural system models has the challenge of considering the complexity of microbial communities, and environmental and ecological aspects of farming. Studying the interaction of agro-ecosystems with other managed and unmanaged ecosystems has several impetuses. These include understanding the importance of ecosystems services such as pollination and biological pest control that natural habitats provide to agriculture. Another application has been the analysis of potential for agricultural greenhouse gas mitigation through soil carbon sequestration. Those field to landscape approaches are moving beyond the research mode into application. Modeling and scenario building have become an integral part of policy and business decision making – helping for example, to identify sustainable management options or screen for potential risk areas.

One of our greatest challenges is the early recognition of systemic risks. This year's PSC Summer School will deal with «Understanding risks and resilience in plant systems». Students will be introduced to systems thinking and predictive tools, and practice how to use, share, and facilitate them.

The PSC Syngenta Symposium 2017 «Modeling in Agriculture» will discuss the state of agricultural system science relative to current and future needs for models, methods and data that are required.

Hope to see you there!

Manuela Dahinden  
PSC Managing director



# Bridging plant sciences and society

*Supported by the Mercator Foundation Switzerland, the PSC awarded four transdisciplinary PhD fellowships. The research projects deal with socially relevant issues from the perspective of two academic disciplines and in collaboration with relevant stakeholders. The desired research outcome is a new, more inclusive approach – bridging plant science and society.*



Sergei Schaub, Maria Vorkauf, Tiago Meier und Kevin Vega (from left to right)

## Values of species diversity in grassland production – An ecological economic assessment

Grasslands are crucial for global food security. They cover the majority of the world's agricultural area and provide many additional ecosystem services. Previous research has identified positive and stabilizing effects of species diversity (SD) on grassland production. I aim to transform these findings into economic terms, i.e., to quantify these potential benefits of SD in terms of farmers' utility. Here, a strong integration of both ecology and agricultural economics is required, although neglected so far. The project has a wide range of stakeholders, including agricultural extension services and schools, farmers, policymakers, and the scientific community.

Sergei Schaub

Department of Environmental Systems Science  
ETH Zurich

### Supervisors

Prof. N. Buchmann (ETH Zurich) and Prof. R. Finger (ETH Zurich)

### Internship partner

Agridea, Arbeitsgemeinschaft zur Förderung des Futterbaus (AGFF) and Federal Office for Agriculture (FOAG)

## Understanding the ecological and economic consequences of climate change in alpine grassland

Changing snow loads and summer drought press alpine plants and force economy. My project aims at examining the effects of altered snow melt dates and summer drought on the alpine ecosystem. I address the economic impact of artificial snowmaking for the currently expanding SkiArena Andermatt Sedrun by modelling future snow reliabilities under different climate change scenarios.

Maria Vorkauf

Department of Environmental Sciences, Botany  
University of Basel

### Supervisors

Prof. A. Kahmen, Dr. E. Hiltbrunner (University of Basel), Prof. B. Abegg (University of Innsbruck) and Dr. C. Marty (SLF Davos)

### Internship partner

Sport AG Andermatt Sedrun



### Papaya: history of its agricultural use and improvements to adapt to a changing climate

The crop plant papaya (*C. papaya* L.) grows in three sexes: female, male, and hermaphrodite. Hermaphrodites can show sex reversal to male in response to high temperatures, causing severe economic damage to papaya farmers. My project aims to understand the molecular basis of sex reversal and to develop markers to identify accessions less prone to sex reversal for organic breeding programs. Also, I wish to shed light on the domestication of papaya on the Yucatan peninsula in Mexico by integrating archeological and molecular data. Papaya farmers will profit from improved papaya varieties that are less prone to sex reversal.

Tiago Meier

Department of Plant and Microbial Biology  
University of Zurich

#### Supervisors

Prof. U. Grossniklaus (University of Zurich),  
Prof. Dr. J.-P. Vielle-Calzada (Langebio Cinvestav)  
and Prof. J. M. Santamaria (Centro de Investigación  
Científica de Yucatán, Mexico)

#### Internship partner

Mexican network for papaya production  
(propapaya.org)

### Maintaining plant biodiversity in cities

I aim to reach an understanding of how plant biodiversity in the city of Zurich can be maintained through ecological design. I will assess fragmentation effects on the species, functional, and genetic diversity of dry meadow patches and the population viability and connectivity of selected model species. In collaboration with my project partners Grün Stadt Zürich and a team of landscape architects from HSR Rapperswil, I will develop an ecological design process that is based on a mechanistic understanding of the underlying ecological processes that maintain biodiversity. We hope that our approach can become a model for ecological urban design beyond biodiversity issues.

Kevin Vega

Institute of Integrative Biology  
ETH Zurich

#### Supervisors

Prof. Ch. Kueffer (ETH Zurich/HSR Rapperswil)  
and Prof. D. Siegrist (HSR Rapperswil)

#### Internship partner

Grün Stadt Zürich

# At a Glance

## Funding opportunities

### Collaborative Doctoral Partnership with the Joint Research Centre of the European Commission

The PSC is submitting a proposal for co-supervision of PhD students at the Joint Research Centre. Located across five different countries, the JRC aims to ensure that the best scientific advice possible informs EU policy development. The PhD students will be enrolled in the PSC PhD Program Science & Policy.

Deadline 15 March 2017

<https://ec.europa.eu/jrc/en/working-with-us/collaborative-doctoral-partnerships>

### Cofunding scheme for PhD students

The PSC wishes to apply for co-funding for a cohort of 20 to 30 PhD students enrolled in the PSC PhD Programs Plant Sciences and Science & Policy.

The training follows the EU Principles on Innovative Doctoral Training including collaboration with non-academic partner organisations.

Deadline for proposal submission 28 Sep 2017

**H2020 - COFUND 2017 - Marie Skłodowska-Curie actions**

### Collaborating with industry

If you are interested in collaborating with industry then join the next PSC proposal for the European Industrial Doctorates Program. The PhD students spend 50% of their time in the non-academic sector. A joint supervision is mandatory. The non-academic partner needs to be located outside Switzerland. If you have an interest to join, please describe briefly the research scope and partners (max. half a page). In total we will be able to apply for 15 PhD fellowships.

Deadline for proposal submission Jan 2018

**H2020 - ITN 2017 - Marie Skłodowska-Curie actions**

#### Contact

Manuela Dahinden, [mdahinden@ethz.ch](mailto:mdahinden@ethz.ch)

## PSC Syngenta Fellowship Program

Applications for PhD and Postdoc fellowships can be submitted until 1<sup>st</sup> of November 2016. The funds are intended to promote innovative research in plant sciences. In addition to the scientific quality of the project and the qualification of the applicants, research co-operation within PSC will be an important criterion in the project selection.

This call is reserved for PSC professors and group leaders.

For application templates please contact:

[mdahinden@ethz.ch](mailto:mdahinden@ethz.ch)

or visit

[www.plantsciences.ch/research/fellowships/syngenta.html](http://www.plantsciences.ch/research/fellowships/syngenta.html)

## Awards

**Jordi Bascompte** (University of Zurich) received the British Ecological Society's Marsh Book of the Year Award for his book *Mutualistic Networks* co-authored with Pedro Jordano (Princeton University Press).



ISBN: 1400848725, 9781400848720

**Nina Buchmann** (ETH Zurich) was elected by the Ministry of Science, Research and Culture of Brandenburg (Germany) into the Scientific Advisory Board of the Leibniz Centre for Agricultural Landscape Research (ZALF).

**Ansgar Kahmen** (University of Basel) received an ERC Consolidator Grant.

**Eri Yamasaki** (University of Zurich) received the Nobuhiko Suzuki Award for young scientists of the Ecological Society of Japan.

**Barbara Pfister** (ETH Zurich) «Recreating the synthesis of starch granules in yeast», **Thind Anupriya Kaur** (University of Zurich) «A cultivar-specific long-range chromosome assembly enables rapid isolation of a disease resistance gene in hexaploid wheat», and **Wilfred Elegba** (ETH Zurich) «Molecular diversity of cassava mosaic geminiviruses in farmer fields in Ghana» won a poster prize at the PSC Symposium.

# Plant protection by leaf-colonizing commensal

*The PhD project was funded by the PSC-Syngenta Fellowship Program, conducted under the supervision of Prof. Julia Vorholt and in collaboration with Prof. Wilhelm Gruissem, both at ETH Zurich.*

Christine Vogel

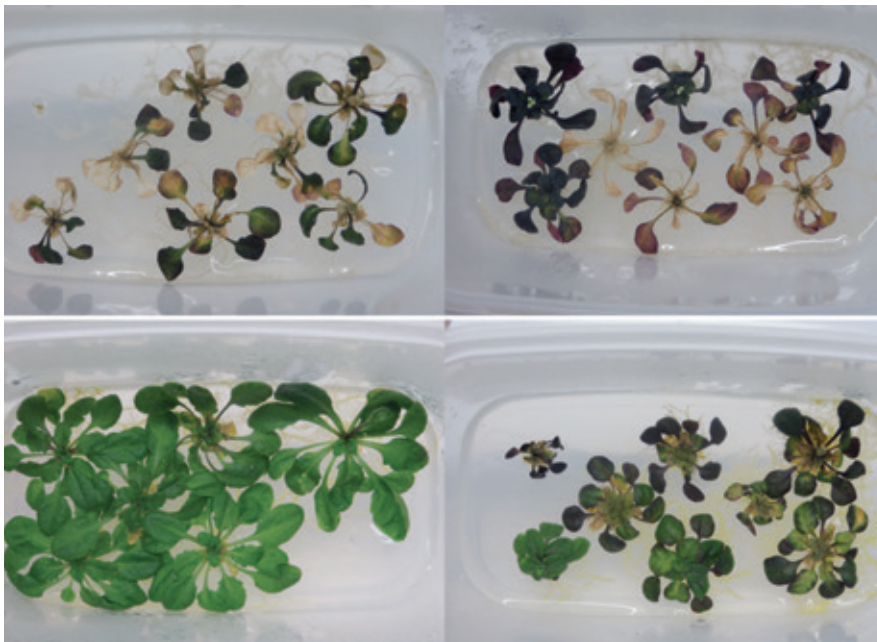
Plants do not live as solitary organisms but provide a habitat for a wide variety of microorganisms, the plant microbiota. These microbial communities can affect the hosts' growth and health and thereby also plant productivity. An abundantly found group of leaf-associated bacteria on various plants are members of the genus *Sphingomonas* that constitute part of the core leaf microbiota. In a model pathosystem, we have shown in our earlier work that various plant-indigenous *Sphingomonas* isolates protect *Arabidopsis* from infection with the foliar pathogen *Pseudomonas syringae* DC3000, reducing pathogen proliferation and disease symptom formation. A number of factors might be involved in protection such as nutrient competition, direct bacteria-bacteria interactions (antibiosis) as well as plant-mediated protection. I

was particularly interested to learn whether the last option could be true. For this reason, we chose to work with a model *Sphingomonas* strain, *S. melonis* Fr1 and used a gnotobiotic (germ-free) model system, which allows studying axenic plants as well as those inoculated with only one type of bacterium. Plant responses to its microbiota, or to pathogen infection in the presence of commensals, are not well understood. We therefore examined the transcriptional response of *A. thaliana* leaves to colonization by *S. melonis* Fr1. We found profound differences in the response of *A. thaliana* to colonization by *S. melonis* Fr1 while another non-protective commensal strain did not trigger plant responses and was essentially invisible to the plant. Surprisingly, the strong response of *Arabidopsis* elicited by *S.*

*melonis* Fr1 overlapped with the transcriptional response by the pathogen *P. syringae*.

Our finding suggested that plant protection could indeed be plant-mediated. Plants have a sophisticated innate immune system with surface-associated pattern-recognition receptors that recognize conserved microbe-associated molecular patterns (MAMPs) to initiate a first layer of defense called pattern-triggered immunity (PTI). In subsequent work, we could show that PTI is required for full plant protection by *S. melonis* Fr1 as plant protection was attenuated in a plant mutant lacking functional co-receptors for different pattern-recognition receptors.

These results now provoke new questions, such as how does the plant detect colonization by *S. melonis* Fr1 and more specifically what molecular determinants are recognized. So far, we excluded well-known MAMPs such as flagellin and elongation factor Tu as elicitors resulting in plant protection by *S. melonis* Fr1. This indicates that «novel» MAMPs must be important. Our future work also aims at analyzing additional strains covering the diversity of the plant microbiota to learn how widespread plant protection by commensals is and to explore the natural potential of indigenous leaf bacteria for plant protection under environmental conditions.



Plant-mediated protection against *P. syringae* DC3000 by *S. melonis* Fr1. Axenic plants (top row) and *S. melonis* Fr1-colonized plants (bottom row) were infected with *P. syringae*. Wild-type plants (left) are protected, whereas PTI mutant plants (right) show attenuated protection by *S. melonis* Fr1.

© Christine Vogel

**The Arabidopsis leaf transcriptome reveals distinct but also overlapping responses to colonization by phyllosphere commensals and pathogen infection with impact on plant health**

Vogel C, Bodenhausen N, Gruissem W & Vorholt J

*New Phytologist*, 212 (1): 192-207 OCT 2016

**Contact**

[christine.vogel@micro.biol.ethz.ch](mailto:christine.vogel@micro.biol.ethz.ch)

## Professor Loïc Pellissier

The properties of landscapes are constantly changing under natural processes (e.g. through orogeny or climate) or anthropogenic effects (e.g. deforestation, agriculture). Life processes, including species growth, dispersal, reproduction and evolution depend on the physical configurations of the landscape, which influence e.g. available resources and energy, connectivity and persistence of populations. The main research interest of my group in Landscape Ecology at ETH Zurich and at the Swiss Federal Institute for Forest, Snow and Landscape Research WSL is to understand how physical and anthropogenic changes in landscapes shape biodiversity at different spatial and temporal scale. Our research spans the legacy of plate tectonics and of the Quaternary glaciation on species assemblages to the effect of ongoing anthropogenic global changes. We develop statistical and process-based models from eco-evolutionary theory to forecast the consequences of climate and land use changes on the future of biodiversity and ecosystem functions. Our model outputs aim at guiding the management of natural resources and the services provided to society. While our main research focuses on terrestrial plants, our group also studies other ecosystems including marine reefs.



Experiment in the region of Anzeindaz (Vaud) quantifying the possible effect of the colonization of insect herbivores on alpine plant communities under climate change. Our group uses field observations and experiments to calibrate and validate models.  
© Patrice Descombes

### Curriculum vitae

Loïc Pellissier received his PhD in Life Sciences from the University of Lausanne in 2012. His PhD focused on the effect of climate change on plant-insect interactions in the Alps. He was awarded a grant to work on the effect of climate change on plant communities in Greenland, which included a research stay at the Arctic Research Center in Denmark. He was then appointed as research group leader at the University of Fribourg. He is now Assistant Professor of Landscape Ecology at the Institute of Terrestrial Ecosystems at ETH Zurich and in the unit of Landscape Dynamic at WSL since July 2015.

Loïc Pellissier  
Professor of Landscape Ecology  
Institute of Terrestrial Ecosystems  
ETH Zurich

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[www.landecology.ethz.ch](http://www.landecology.ethz.ch)



© Nadine Sandau



## Science (2016)

doi: 10.1126/science.aaf6268

**Rapid evolution accelerates plant population spread in fragmented experimental landscapes**

Williams JL, Kendall BE, Levine JM

Predicting the speed of biological invasions and native species migrations requires an understanding of the ecological and evolutionary dynamics of spreading populations. Theory predicts that evolution can accelerate species' spread velocity, but how landscape patchiness — an important control over traits under selection — influences this process is unknown. We manipulated the response to selection in populations of a model plant species spreading through replicated experimental landscapes of varying patchiness. After six generations of change, evolving populations spread 11% farther than non-evolving populations in continuously favorable landscapes and 200% farther in the most fragmented landscapes. The greater effect of evolution on spread in patchier landscapes was consistent with the evolution of dispersal and competitive ability. Accounting for evolutionary change may be critical when predicting the velocity of range expansions.

## Nature Genetics (2016)

doi: 10.1038/ng.3617

**Sequencing of the genus *Arabidopsis* identifies a complex history of nonbifurcating speciation and abundant trans-specific polymorphism**

Novikova PY, Hohmann N, Nizhynska V, Tsuchimatsu T, Ali J, Muir G, Guggisberg A, Paape T, Schmid K, Fedorenko OM, Holm S, Säll T, Schlötterer C, Marhold K, Widmer A, Sese J, Shimizu KK, Weigel D, Krämer U, Koch MA & Nordborg M

The notion of species as reproductively isolated units related through a bifurcating tree implies that gene trees should generally agree with the species tree and that sister taxa should not share polymorphisms unless they diverged recently and should be equally closely related to outgroups. It is now possible to evaluate this model systematically. We sequenced

multiple individuals from 27 described taxa representing the entire *Arabidopsis* genus. Cluster analysis identified seven groups, corresponding to described species that capture the structure of the genus. However, at the level of gene trees, only the separation of *Arabidopsis thaliana* from the remaining species was universally supported, and, overall, the amount of shared polymorphism demonstrated that reproductive isolation was considerably more recent than the estimated divergence times. We uncovered multiple cases of past gene flow that contradict a bifurcating species tree. Finally, we showed that the pattern of divergence differs between gene ontologies, suggesting a role for selection.

## Nature Plants (2016)

doi: 10.1038/NPLANTS.2016.168

**Evolution of sex-biased gene expression in a dioecious plant**

Zemp N, Tavares R, Muyle A, Charlesworth D, Marais GAB &amp; Widmer A

Separate sexes and sex-biased gene expression have repeatedly evolved in animals and plants, but the underlying changes in gene expression remain unknown. Here, we studied a pair of plant species, one in which separate sexes and sex chromosomes evolved recently and one which maintained hermaphrodite flowers resembling the ancestral state, to reconstruct expression changes associated with the evolution of dioecy. We found that sex-biased gene expression has evolved in autosomal and sex-linked genes in the dioecious species. Most expression changes relative to hermaphrodite flowers occurred in females rather than males, with higher and lower expression in females leading to female-biased and male-biased expression, respectively. Expression changes were more common in genes located on the sex chromosomes than the autosomes and led to feminization of the X chromosome and masculinization of the Y chromosome. Our results support a scenario in which sex-biased gene expression evolved during the evolution of dioecy to resolve intralocus sexual conflicts over the allocation of resources.

## Genome Biology (2016)

doi: 10.1038/ng.3485

**Rapid gene isolation in barley and wheat by mutant chromosome sequencing**

Sanchez-Martin J, Steuernagel B, Ghosh S, Herren G, Hurni S, Adamski N, Vrana J, Kubalaková M, Krattinger SG, Wicker T, Doležel J, Keller B, Wulff BBH

Identification of causal mutations in barley and wheat is hampered by their large genomes and suppressed recombination. To overcome these obstacles, we have developed MutChromSeq, a complexity reduction approach based on flow sorting and sequencing of mutant chromosomes, to identify induced mutations by comparison to parental chromosomes. We apply MutChromSeq to six mutants each of the barley Eceriferum-q gene and the wheat Pm2 genes. This approach unambiguously identified single candidate genes that were verified by Sanger sequencing of additional mutants. MutChromSeq enables reference-free forward genetics in barley and wheat, thus opening up their pan-genomes to functional genomics.

## Trends in Ecology &amp; Evolution (2016)

doi: 10.1016/j.tree.2016.02.016

**An underground revolution: biodiversity and soil ecological engineering for agricultural sustainability**

Bender SF, Wagg C, van der Heijden MGA

## Molecular Biology and Evolution (2016)

doi: 10.1093/molbev/msw175

**Genomic imprinting in the endosperm is systematically perturbed in abortive hybrid tomato seeds**

Florez-Rueda AM, Paris M, Schmidt A, Widmer A, Grossniklaus U, Stadler T

## Nagoya Protocol

Sylvia Martinez

There is a considerable global market for products derived from natural resources, just think of the pharmaceutical, cosmetic and agricultural sector. These products are developed with modern scientific methods and are often based on plant, animal or microbial resources derived from countries in the southern hemisphere. In many cases the traditional knowledge of local communities about the health benefits of certain genetic resources trigger the development of new products. In order to also let the countries of origin of the genetic resources benefit from the scientific knowledge advances and commercial profits, the *Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from Their Utilization* was negotiated within the Convention on Biological Diversity (cbd.int). In Switzerland the Nagoya Protocol Ordinance (NagV) came into force on 1 Feb 2016, and together with the Swiss law on protection of natural and cultural heritage (NHG), it forms the legal basis for the access and benefit-sharing of genetic resources from another country. This law also applies to academic research. Regarding non-commercial research, the ordinance places an obligation on scientists to apply due diligence and to store information on the accessed genetic resources (biological material) from a country that is a signatory to the Nagoya Protocol. The Federal Office for the Environment (FOEN) has to be notified before products using genetic resources are marketed. Furthermore, FOEN is the Competent National Authority for the implementation of the Nagoya Protocol and provides information for researchers and others. The Swiss National Science Foundation has added a section on Access and Benefit Sharing (ABS) to its research application forms. **The Swiss Academy of Sciences offers a website for academia. And the Swiss Academies of Arts and Sciences just published a**

### Good Practice Guide for Access and Benefit Sharing and a Toolbox for drafting Mutually Agreed Terms.

[www.naturwissenschaften.ch/organisations/biodiversity/abs](http://www.naturwissenschaften.ch/organisations/biodiversity/abs)



### PhD Courses

#### Science & Policy: Building Political Support

7 Feb-8 Mar

#### Research with biological material from abroad: International regulations and due diligence in research

16-17 Mar

#### Responsible Conduct in Research

10 Mar-5 May

#### Scientific Presentation Practice

31 Mar-21 Apr

#### Project Management for Research

4-18 Apr

#### Concepts in Evolut. Biology (BIO 395)

10-11 Apr

#### Filmmaking for Scientists

24-28 Apr

#### Biology of Orchids

4-5 May

#### Science & Policy: Communicating Science

8-22 May

#### Introduction to UNIX/Linux and Bash Scripting (BIO609)

9 May

#### Dealing with the Publication Process

24 May-7 Jun

#### Genetic Diversity: Analysis

12-16 Jun

#### Science & Policy: System Thinking

13-15 Jun

#### Conservation Management: Field Course, Western Highlands of Scotland

24 Jun-1 Jul

#### Introduction to R

10-11 Jul

#### Alpine Ecology in Plant Life - International Summer School

16-22 Jul

### Frontiers in Plant Sciences

#### Niche Modeling

Prof. Guisan and Prof. Zimmermann  
15 & 16 February 2017

Best practice of modeling, data collection and preparation, model fitting, model evaluation and application.

#### Pathways and Fluxes: Plant Metabolic Network

Prof. Ratcliffe & Dr. Kruger  
22 & 23 March 2017

Methods used for the prediction and measurement of fluxes in the plant metabolic network / Assessment of the applicability and significance of these methods.

#### NGS I - Introductory Course: Assembly, Mapping and Variant Calling

Prof. Shimizu, Prof. Sese, Dr. Inatsugi, Dr. Hatakeyama, Dr. Matsumae  
10 & 11 May 2017

Overview of current NGS applications and platforms / Analysis of NGS data through all the steps of a basic NGS workflow.

#### NGS II - Advanced Course: Transcriptomes, Variant Calling and Biological Interpretation

Dr. Wyder, Dr. Lischer, Prof. Shimizu  
16 & 17 May 2017

Discuss NGS applications and their data analysis principles / Analysis of an RNA-seq experiment and call SNP variants using multiple software tools.

#### QTL Analysis

Prof. Jünger and Prof. Grossniklaus  
19-21 June 2017

Exploring the use of quantitative genetic experiments / Quantitative trait locus (QTL) analyses, and linkage disequilibrium (LD) mapping as tools for dissecting the genetic details of continuous variation.

#### Advanced Data Management

Dr. Wunder  
26 & 27 June 2017

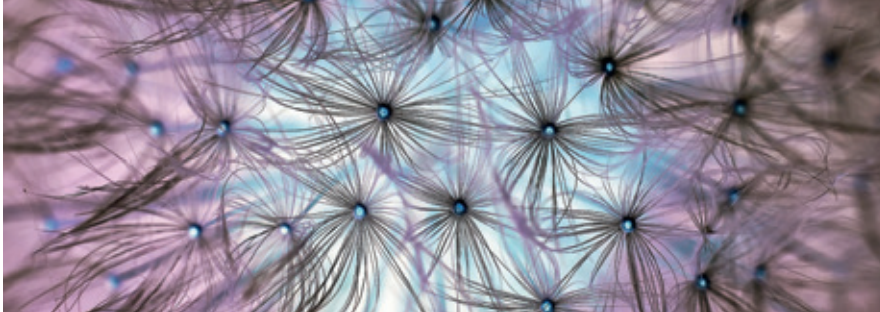
Use of R to manage and manipulate large data sets, i.e. to sort, merge, subset, aggregate and reshape data, including outlier detection and gap filling algorithms.

### Registration

<http://spsw.registration.ethz.ch>

# Benefit from PSC mentoring

*PhD students and postdocs are welcome to join our mentoring that supplements the PSC training programs.*



## Zukunftsforen – Engage with the public A call for PhD student involvement

Melanie Paschke

PSC is adding a new element to its PhD education and a step towards public engagement and ethical discourse with the «Zukunftsforen». They will be held in April and June 2017. They will bring together PhD students with the public to carry out an ethical and social discourse on socially relevant research in plant sciences. Topics are:

### ▪ Our personal life styles under 2030 climate change scenarios

How can we mitigate climate change? Is it technological progress (e.g. clean tech), regulation (e.g. CO<sub>2</sub> emission taxes) or changes of personal life style (e.g. deceleration/décroissance, sufficiency) that will make the difference? How might we live in 2030 and on what values and beliefs do we base the different narratives?

### ▪ Transition to sustainable agriculture 2030

Agriculture is a major driver of biodiversity loss, CO<sub>2</sub> emission, fresh water depletion and soil degradation. A transition of agriculture towards a sustainable farming practice that includes an environmentally friendly, a socially responsible and an economically viable dimension is needed. Here, consumer's choices can send the decisive signals for incremental adjustments or fundamental changes. How do personal and normative values lead our vision of sustainable agriculture 2030?

Public engagement of scientists offers an excellent opportunity for connecting citizens and policy stakeholders with science as part of a participative (legitimation) process. Especially if scientific results are imposing on societal values or if they are linked to normative choices, researchers should actively engage in a dialogue with non-specialists to listen to and to interact with them.

Students are welcome to contact: [sascha.ismail@usys.ethz.ch](mailto:sascha.ismail@usys.ethz.ch)

**Organisation:** Participants will meet in early April for a 1-day training workshop on public engagement and social dialogue approaches. Thereafter each participant is invited to join one of the workshops held for the public in May and June as a facilitator and to present his/her science project (in German).

*Time commitment: 30 hours/1 ECTS*

### One to One Mentoring

PSC offers one-to-one mentoring in improving the impact of research through involvement in public dialogue and outreach activities. In 2017 it includes Zukunftsforen, Scientifica, school class workshops and science holiday camps.

#### Contact

[info-plantscience@ethz.ch](mailto:info-plantscience@ethz.ch)

### Career Development

#### PSC Career Development Programme for Postdocs continues

Since 2010 the PSC has been organizing a career development program. Postdocs can accredit their continuous education and career development activities in a training certification. It is based on the EU recommendations for life-long learning that assures recognition of qualifications in Europe. Altogether, fellows need to follow 180 hours of training and career development. It includes 40 hours dedicated to the specific training needs set out in a Personal Development Plan.

#### Information and Documentation:

[www.plantfellows.ch/node/343](http://www.plantfellows.ch/node/343)

### Next Training Course

#### Leadership Skills for Postdocs

29-30 Mar 2017, ETH Zurich

Being able to lead and manage researchers is part of becoming an independent researcher in plant sciences. This requires leadership and management skills in addition to academic skills and interpersonal competencies. This course aims to assist postdocs to develop leadership skills that will enable them to manage people in their project and research environment.

*Max. 18 participants, free of charge*

#### Registration

<https://spsw.registration.ethz.ch>

## World Cafés – Science and Society

*The PSC Discovery Workshops is a program that the PSC is currently running in collaboration with the MINT Learning Center of the ETH Zurich. High school students from Gymnasium and Secondary Schools engage in Inquiry Based Learning in a university setting. The World Cafés enable dialogue between researchers and high school students and are integral to the Discovery Workshop format.*

Juanita Schläpfer & Carole Rapo

The Discovery Workshops with World Cafés are providing an opportunity for science and society to meet – inspiring for the students and rewarding for the researchers. After the practical experiment, the students divide into groups, each with a moderator, and address one of four questions, which focus on the workshop theme such as «Smart Breeding» or «Agriculture and Climate Change». The students write their questions and comments on cards and these are grouped by theme and mounted on a poster. At the end of the session each group presents their discussions to the whole class.

Questions that have been posted include: What are the innovations & technologies in plant science research that can contribute to ensuring food security? What are the dilemmas/opportunities of the technologies? What issues must society address? Why should students care about such research?

The results of the World Cafés have so far been mixed. Some groups clearly need more time to feel comfortable expressing their opinions, others are articulate and well informed – it often appears to depend on the amount of preparation the class has had, or how used they are to having such discussions.

The World Café run during the first pilot workshop on Smart Breeding with Prof. Bruno Studer in June 2016 illustrated that

this open format of discussion is of high value to the students. Whereas, they were somewhat shy during the introduction and practical, once given the opportunity, they had a lot to say and the discussions were animated and dynamic. Especially regarding food security, they proposed various solutions such as: «new form of food» (insects, algae); «Urban Farming»; «less food waste»; «eating seasonal and regional»; «better share of the resources». In the discussion on agriculture and climate change with Dr. Susanne Burri some of the keywords were: consumer responsibility, drought resistant plants, efficient irrigation.

So far we have seen that high school students are very concerned with environmental and food issues. Their prior knowledge of plant breeding is often limited to classical genetic engineering. While some express concern about these technologies they were definitely animated by the ideas of Smart Breeding, for example: «Pflanzen an die klimatischen Wetterverhältnisse anpassen», «Smart Breeding ist ein sehr guter Anfang, es wird wahrscheinlich nicht ausreichen für die Zukunft». During the World Café, the students discussed how the selection of plants resistant to heat, water, salinity and specific pathogens might contribute to solutions of food security.

The PSC Discovery Workshops are supported by SNSF Agora funds.



Climate Change mind-map created by high school students in July 2016 © J. Schläpfer

## New Agora Project: PSC Creative Camps

The PSC is excited to announce that for the third time it received financial support from the SNSF Agora funding scheme. Starting from April 2017 the PSC will develop creative and inquiry based workshop activities for young people aged 8-14. They will enrich and advance informal science education offers outside of school activities, but particularly in holiday camps. PSC has been running science camps for a few years now, and new in this context is that together with art educators from the Zurich University of the Arts, we will integrate creative methods from the arts into informal science learning.

We will collaborate with several afterschool programs to share our experiences and to facilitate the use of the workshop materials. Our long-term aim is to create new formats and environments for informal science education «Wissenschaftsferien Schweiz». We will present the program in more detail in the next issue of the PSC newsletter.

## The Klimagarten exhibit moves to the Botanical Garden in Bern

The Klimagarten 2085 exhibition curated by the PSC in conjunction with the Botanical Garden of the University of Zurich in 2016 will be installed in the Botanical Garden of the University of Bern from April-July 2017. In Bern the exhibit will focus on biodiversity and climate change. The PSC team is happy to pass the baton on to Bern and is excited to see how the concept develops.

### Contact

[anne-laure.junge@ips.unibe.ch](mailto:anne-laure.junge@ips.unibe.ch) | [www.botanischergarten.ch](http://www.botanischergarten.ch)

## Contribute to the International Fascination of Plants Day on 18 May 2017

On May 18th the world will celebrate the International Fascination of Plants Day in order to highlight the importance of plants and plant research for society's well-being. This day is an excellent opportunity to engage with the public and make people more aware of the great benefits that plants offer. Institutions and companies are invited to organize plant-related events for the public on or around May 18th.

This initiative is launched by the European Plant Science Organization (EPSO).

The Swiss Plant Science Web coordinates and promotes all events in Switzerland.

[plantday.org](http://plantday.org) | [swissplantscienceweb.ch](http://swissplantscienceweb.ch)

### Contact

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Fascination of  
Plants Day  
May 2017

### Expeditions & Camps

#### Familien Expedition Alpenpflanzen – Ihr Leben und Überleben im Hochgebirge

12-13 Aug 2017

With Christian Körner & Erika Hiltbrunner, University of Basel

**Zielpublikum:** Jugendliche (10–16 J.) und erwachsene Begleitpersonen

**Ort:** Forschungsstation ALPFOR, Furkapass, Urner Alpen

#### Camp Discovery 2017 Abenteuer Wissenschaft – Ein Ferienlager mit Experimenten zum Selbermachen

7-12 Aug 2017

With Juanita Schläpfer, PSC

**Zielpublikum:** Junge EntdeckerInnen (3-6 Klasse)

**Ort:** Ferienhaus der Stiftung Zürcher Schulferien in Beatenberg, Berner Oberland

### Discovery Workshops

Open to high school students from Gymnasium and Secondary Schools - courses held on demand



PSC  
DISCOVERY  
WORKSHOPS

KLIMAWANDEL  
3D MIKROSKOPIE  
SMART BREEDING  
ADAPTIVE EVOLUTION  
PFLANZENMETABOLISMUS  
SYMBIOSE

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# IDP BRIDGES - Final Event

## Bridging Science and Policy

5 April 2017, Aula of the University of Zurich

Do not miss the ceremonial closing ceremony of the IDP BRIDGES Innovative Doctoral Program. 13 PhD students will present their outcomes. For example, key factors influencing the success of biofertilization, assessment of forest policy design to mitigate climate change, the use of RNAi as fungicide, potential of epigenetics for the organic sector, drafting a patent landscape for the use of apomixis as a technology. Participating in the PSC Science and Policy training and mentoring program, the scholars developed skills in evidence-based policy making, participatory processes in policy, evaluation of value judgments, and communicating risks and uncertainties. The research projects were supervised by researchers in the PSC network and by representatives of policy-implementing organizations. During internships the students translate scientific results into outcomes at the science-policy or science-innovation interface.

Dr. Marco Lambertini, Director General at WWF International, will present highlights of the Living Planet Report 2016. He will show how scientific evidence has been integrated in this report and how researchers can actively contribute to the WWF strategy papers. Moreover, he will define the role of WWF International as an NGO at the interface of policy, science and the civic sector.

### Programm

- 16:15 Welcome and synthesis from IDP BRIDGES
  - 16:30 Keynote talk by Marco Lambertini, WWF International
  - 17:15 Discussion
  - 18:00 PhD Project pitches
  - 18:15 Dialogue session: My work and the policy context
- Apéro

### Registration

<https://ethz.doodle.com/poll/645eh49ywkeax45>

This project receives funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no PITN-GA-2013-608422 – IDP BRIDGES.

# PSC-Syngenta Symposium

## Modeling in Agriculture

30 Aug 2017, Syngenta Crop Protection AG, Stein

This one-day symposium will focus on an exchange of innovations and challenges in agricultural system modeling. The last decade has seen major investments from research agencies and governments to develop forecasting and decision-making tools. We will discuss the state of agricultural system science relative to current and future needs for models, methods and data that are required.

[www.plantsciences.uzh.ch/en/research/fellowships/syngenta/symposia.html](http://www.plantsciences.uzh.ch/en/research/fellowships/syngenta/symposia.html)



**Charlotte Pavageau** «My PhD project focused on how the landscape drives pollination services in a coffee growing region. We analyzed the importance of land-use mosaic, in particular the implication of agroforests and forest fragments, as well as of local management practices to attract pollinators in coffee plantations. Besides, we developed two alternative management scenarios that potentially impact pollination service: a better coordination between farmers by irrigation scheduling and nesting site conservation. One of the main challenges is to integrate various ecosystem services and various priorities and to link them to stakeholder perspectives. The picture shows an experimental plot in a coffee plantation».  
© Charlotte Pavageau

### Outlook

30 Nov & 1 Dec 2017

#### PSC Symposium Dynamics in Plant Development and Evolution

Auditorium Maximum ETH Zurich

18 lectures among the most innovative researchers will share their experience and most recent scientific results on plant adaptation, responses and morphogenesis. Some of the addressed questions are: Is the behavior of complex genetic networks predictable during plant development? Which is the interplay between mechanical forces, morphogenesis and signaling cascades? How do environmental cues reprogram cell activities throughout plant evolution?

[www.plantsciences.ch/symposium](http://www.plantsciences.ch/symposium)



# PSC Summer School 2017

## Understanding Risks and Resilience in Plant Systems

29 May - 2 June 2017, Einsiedeln

Melanie Paschke

With humankind leaving the planetary boundaries and the safe operating space, systemic risks have become frequent: our climate system is approaching a new state. Biodiversity losses are endangering ecosystem services; pests are globally spreading and threatening our food security. Complex systems are characterized by inter-connections between species, agents, individuals and multiple stable states whereas regime shifts can be triggered after periods of stability towards non-linear behavior, i.e. path dependence, sustained oscillation, contagion and synchrony. Systemic risks arise from the potential for unpredictable changes of the system to another state. While we cannot predict the tipping point, we can stabilize the system in the current state through increasing or restoring resilience and diversity.

In this Summer School we will discuss modeling of variable to be considered in complex systems and their threshold effects as well as some interaction at the socio-ecological interface, the so-called complex adaptive systems. The range of topics spans from plant sciences to economy with a focus on modeling from the mathematical background to complex ecological models. Research and case studies are from climate change, ecosystem research, epidemiology, agriculture and economics with strong links to plant sciences.

Invited speakers will present state-of-the-art tools, conduct interactive workshops and take part in plenary discussions. They will act as mentors in the case studies group work. The outcome of the group work will be available in the proceedings.

Registration: <https://www.registration.ethz.ch/spsw>

Contact: [carole.rapo@usys.ethz.ch](mailto:carole.rapo@usys.ethz.ch)

### Program and Invited Speakers

#### Systemic Risks: Overview

- Dr. Pia-Johanna Schweizer, Institute for Advanced Sustainability Studies, Berlin, Germany

#### Examples for systemic risks in the climate system

- Dr. Melanie Paschke, PSC, Switzerland

#### Modeling of variable to be considered in complex systems

- Prof. Mary Lou Zeeman, Bowdoin College, Brunswick, ME, USA
- Adam Clark, MSc, University of Minnesota, USA

#### Examples for systemic risks from plant epidemiology and from plant ecology

- Prof. Chris Gilligan, University of Cambridge, United Kingdom
- Dr. Christophe Randin, University of Lausanne, Switzerland

#### Examples for systemic risks from economy

- Prof. Robert Finger, ETH Zürich, Switzerland
- Dr. Matthew Barbour, University of Zurich, Switzerland

The Zurich-Basel Plant Science Center is a competence center linking and supporting the plant science research community of the University of Zurich, ETH Zurich and the University of Basel. The center promotes fundamental and applied research in the plant sciences. We seek creative approaches to research mentoring and coursework for students and postdocs, and we provide platforms for interactions with peers, policymakers, industry, stakeholders and the public.

## PSC Member Institutions

Institute of Agricultural Sciences, ETH Zurich

Institute of Integrative Biology, ETH Zurich

Institute of Microbiology, ETH Zurich

Institute of Terrestrial Ecosystems, ETH Zurich

Department of Evolutionary Biology and Environmental Studies, University of Zurich

Department of Plant and Microbial Biology, University of Zurich

Department of Systematic Botany, University of Zurich

Department of Environmental Sciences, University of Basel

Zurich-Basel Plant Science Center, Coordination Office

[www.plantsciences.ch](http://www.plantsciences.ch)

