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PlantScienceNews

Newsletter of the Zurich-Basel Plant Science Center

No 29, Spring 2016

Upcoming Events

Fachtagung – Neue Technologien im Pflanzenschutz
8 Jun 2016, ETH Zurich

PLANT FELLOWS Symposium – Final Meeting
23 Jun 2016, Zurich

PSC Summer School – Agriculture in Transformation
11-16 and 19 Sep 2016, Einsiedeln

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Newsletter No. 29, Spring 2016

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Pictures
Courtesy of PSC staff or indicated

Printing
HELLER DRUCK AG, Zurich

Print run
500 copies

Paper
Lessebo bright smooth, FSC

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Cover picture
Gianalberto Losapio
Department of Evolutionary Biology and Environmental Studies, University of Zurich,
Sampling of cushion plant community within 20 x 20 cm plots in the high-elevation Sierra Nevada Mountains in Spain. The foundation species *Arenaria tetraquetra spp. amabilis* and the beneficiary species *Jasione amethystina, Sideritis glacialis* and *Anthyllis vulneraria subsp pseudoarundana* growing upon its cushion. In this harsh environment, foundation species provide facilitative effects for growing and survival of subordinates beneficiary species.

Editorial

Global Change – a core research topic in the PSC

In December last year, 195 nations adopted an action plan to limit the increase of global warming to well below 2°C. The so-called Paris agreement recognizes the importance of reducing greenhouse gas emissions and aims at minimizing the damage associated with the adverse effects of climate change. What are the implications of this for plant science research?

In this issue of the PSC newsletter we reflect on the importance of the topic and illustrate the contribution of our members. Among research priorities are the conservation of biodiversity and minimizing carbon emissions from agriculture. Under the theme of Climate Smart Agriculture plant scientists endorse a holistic approach to agriculture and the food production system. The aim is to increase or maintain outputs while respecting and safeguarding the natural environment and biodiversity. At the same time, plant scientists analyse agriculture`s ability to deal with the impacts of climate change. Especially, through an increased understanding of adaptation and plant stress resistance. As temperatures continue to rise, and extreme weather events such as droughts and floods become more frequent, farmers face more unpredictable and difficult growing conditions. With no doubt, more investment in research is needed if we wish to develop and implement more resilient crops and agroecosystems.

Yet it is not only agriculture, but also cities that play a key role in climate change research. Cities are a major contributor to air pollution, and also are particularly vulnerable to the effects of climate change, since they are living and working center for more than 70% of the world population. Plant scientists are involved in developing sustainable concepts of municipal urban development. This includes the preservation and expansion of green areas, landscaping of facades and roofs. Business and public policy decisions will be increasingly based on climate models that simulate the impact of climate change on current and planned urban landscape developments. Widespread comprehension of climate models and the role of plant science is crucial to future challenges.

On April 1st, the PSC launches a public art and science exhibition in the city of Zurich. The Klimagarten 2085 project visualizes the impact of climate change in Switzerland in a tangible format for the general public and engages citizens with their climate smart future.

Manuela Dahinden
PSC Managing director

Rainout shelters simulating drought events on grassland monocultures in the vicinity of Zurich © Claudia Hahn

Facing climate change

PSC plant scientists contribute in many ways. Here we present examples of on-going research activities.

I apply drought stress to common European grassland species at different times of the year and at different phenological stages. Through these methods I hope to understand the interacting effects of seasonal drought events (spring, summer, autumn droughts) and phenological stages on fodder production and quality. My work helps to understand the processes underlying drought-induced biomass loss in forage crops, and contributes to the development of adapted management strategies, which can be disseminated directly to stakeholders in agriculture, seed industry or to policymakers.

Claudia Hahn
IDP BRIDGES Fellow
Department of Environmental Sciences, Botany
University of Basel

My research builds towards an understanding of how global change affects biodiversity, ecosystems services, politics, economics, and culture and how interactions and feedbacks are patterned among physical, biological, and human entities. My goal is to predict for example, how temperature affects food webs, how land use change affects carbon storage, and how multiple environmental changes combine with each other.

Maria A. Parreño
PhD student
Department of Evolutionary Biology and Environmental Studies
University of Zurich

Climate change is expected to cause more frequently occuring periods of drought, which will reduce the agricultural yields substantially. One of our research group's aim is to breed for drought tolerance forage crops, i.e. the perennial ryegrass. To this end, we investigate the gene regulatory networks, which underpin drought response. Of particular interest for us are the highly connected genes (hub-genes), which are key regulators of drought response and therefore excellent candidate genes for crop improvement. Our aim is to understand the molecular mechanisms underlying those genes and apply this knowledge also to other crop varieties.

Steven Yates & Kristina Jonaviciene
PLANT FELLOW & Postdoc
Institute of Agricultural Sciences
ETH Zurich

Siberia © Maria A. Parreño

Our research investigates which genes are involved in cassava drought tolerance and how they are regulated. We are particularly interested in finding candidate genes, which could improve the root system architecture of cassava under drought conditions. The ultimate goal is to genetically improve this important crop species, in order to cope with more frequent drought episodes due to climatic change.

Ezequiel Lentz
PLANT FELLOW
Institute of Agricultural Sciences
ETH Zurich

My research focuses on flowering in non-seasonal tropical rainforests in Southeast Asia, which often occurs at the community level and seems to be triggered by irregular droughts. Using the plant genus *Macaranga*, which has mutualistic relationships with ants, I investigate how gene expression patterns change in response to drought or other environmental factors and if these changes cause the flowering of the plant.

Eri Yamasaki
PLANT FELLOW
Department of Evolutionary Biology and Environmental Studies
University of Zurich

I and my research group investigate how the impacts of climate change are mediated by changes in species interactions. We transplant communities of competitors along elevation gradients in the Swiss Alps to simulate different climate change scenarios. Superimposed on these experiments are manipulations of plant competition to determine how this factor affects the climate change responses of individual species.

Jonathan Levine
Professor of Plant Ecology
Institute of Integrative Biology
ETH Zurich

One major topic in my research group focuses on the molecular mechanisms underlying the regulation of stomatal guard cells. Guard cells modulate stomatal pore size by coordinating responses to environmental and physiological factors including light, temperature, CO_2, Ca^{2+} and the plant hormone abscisic acid. Our research will contribute to an understanding of how plants will respond to climate change and increased temperatures at the leaf level.

Enrico Martinoia
Professor of Molecular Plant Physiology, Department of Plant and Microbial Biology
University of Zurich

My aim is to study the effects of drought stress on growth and bioactives content of potatoes. First, tuber growth under drought stress will be assessed for two commercial varieties thanks to X-ray computed tomography. Then, fifteen different native potato landraces from Chile will be screened for the effect of drought stress on their content of bioactives in field conditions. Finally, my aim is to evaluate the potential of potatoes as functional food in Chile.

Guillaume Lacavé
IDP BRIDGES Fellow
Institute of Agricultural Sciences
ETH Zurich

My goal is to answer the question whether forests with higher biodiversity take up more carbon dioxide from the atmosphere than less diverse forests, and whether they thus mitigate global warming. I measure tree growth as a function of different aspects of tree diversity, scaling up from plot to local and regional level. From this, I develop forest biodiversity management strategies, supply scenarios and guidelines for diversity plantation forests in subtropical China and elsewhere.

Yuanyuan Huang
IDP BRIDGES Fellow
Department of Evolutionary Biology and Environmental Studies
University of Zurich

Installing literfall trap© Yuanyuan Huang

Sugar accumulation is one of the mechanisms plants have evolved to withstand water stress. Using molecular and biochemical approaches, my research aims to investigate the role and mechanism of sugar accumulation in the guard cells of *Arabidopsis thaliana*, during the diurnal cycle and in response to water stress. This work has the potential to identify new components of the carbon-related stress response pathway, which could contribute to the improvement of crops.

Arianna Nigro
IDP BRIDGES Fellow
Department of Plant and Microbial Biology
University of Zurich

Global climate change emphasizes the current species extinction crisis and the need to understand the factors that maintain biodiversity in natural ecosystems. I investigate how habitat filtering and intra-specific competition interact to shape species distributions and also, identify the key drivers contributing ultimately to species diversity in species rich plant communities.

Robert Bagchi
former PLANT FELLOW
currently Assistant professor at the University of Connecticut, USA

Alpine regions are the most threatened by global climate change and at the same time not well studied at the evolutionary level. Yet, alpine ecosystems are highly interesting, given the paradox that their species diversity is high, despite the rather unfavorable conditions. Using the plant genus *Primula* (primrose) as a model, my aim is to investigate the drivers of speciation in plants of these alpine ecosystems.

Florian Boucher
PLANT FELLOW
Department of Systematic Botany
University of Zurich

Our aim is to provide knowledge for a sustainable use of forests and agroecosystems. This requires process- and system-understanding of their functioning as well as their interactions with human and biophysical drivers. We investigate ecosystem biogeochemistry and plant functional diversity to understand ecosystem responses to climate and management. We focus on biospheric - atmospheric greenhouse gas and energy exchange, but also on the interactions between plant diversity and ecosystem functions.

Nina Buchmann
Professor of Grassland Science
Institute of Agricultural Sciences
ETH Zurich

My aim is to understand the role of plant interaction networks in modulating the impact of environmental change on plant community structure and ultimately, ecosystem stability. In an observational and simulation study I want to assess the robustness of a plant - plant network to four different environmental change scenarios, and evaluate the role of positive interactions for species persistence through avoidance of secondary extinctions.

Gianalberto Losapio
PhD student, Institute of Evolutionary Biology and Environmental Studies
University of Zurich

I am interested in understanding landscape biodiversity patterns and how species populations may respond to climate change. Increasing temperatures, for example, are likely to increase herbivore abundance at high elevation in the Alps, which subsequently may change the current community composition. Using modeling approaches and remote sensing technologies, my aim is to track landscape changes and to develop forecasts, which improve the management of natural resources and services to human population.

Loïc Pellissier
Professor of Landscape Ecology
Institute of Integrative Biology
ETH Zurich

A. thaliana plants from different populations and different crosses in the greenhouse © Marie Roumet

Adaptive potential of alpine *Arabidopsis* populations

This research was supported by a PLANT FELLOWS postdoc fellowship in the group of professor Alex Widmer at the ETH Zurich.

Marie Roumet

Alpine plants often form spatially structured populations that are distributed along altitudinal gradients. In a changing environment, the long-term persistence of such populations may depend on their ability to either migrate to track their preferred environmental conditions or to adapt in situ to the new environmental conditions. According to population genetic models, the adaptive potential of populations is positively correlated with their genetic diversity. Indeed, the more variation exists in a population, the better that population will be prepared to adapt to changing conditions. The level of genetic variation within a population largely depends on its size and the degree of connectivity with other populations. Population size determines the strength of genetic drift (random fluctuations in allele frequencies due to finite population size) that causes loss of diversity and promotes the fixation of deleterious mutations. Migration and gene flow may counteract these negative effects by increasing genetic variability and, when populations have fixed different recessive deleterious alleles, by masking their effects in heterozygous individuals. However, gene flow may also jeopardize population persistence through the introduction of locally maladaptive alleles. Because of these contrasting scenarios, it is difficult to predict the consequences of climate change for the persistence of alpine plant populations.

My research project focused on the evolutionary potential of alpine populations of *Arabidopsis thaliana*. Specifically, I investigated six populations located at low and high altitudes in the Swiss Alps. I characterized the level and distribution of genetic variation within and among-populations and studied the effects of migration by experimentally crossing individuals within and between populations and altitudes.

Population genetic analyses revealed that all populations are small and harbour extremely limited genetic variation. They also revealed that gene flow is strongly restricted, as expected for a highly selfing species. The crossing experiment uncovered that some offspring families expressed a fitness advantage whereas others suffered a fitness disadvantage. This indicates that gene flow may lead to the masking of deleterious alleles in some crosses, but to the formation of maladaptive gene combinations in others. Interestingly, deleterious mutations and genetic incompatibilities were inferred in all populations and for all cross types and thus have accumulated largely randomly among lines and populations. Our results show that, as expected from theory, genetic drift shapes the evolution of small and isolated alpine populations of *A. thaliana*. Drift not only reduces their adaptive potential through the loss of genetic diversity and the accumulation of deleterious mutations, but also reduces the probability that gene flow has beneficial effects as a consequence of the evolution of genetic incompatibilities.

This study reveals that plants with small natural populations and limited genetic diversity, be it as a consequence of the mating system or strong isolation, may not benefit from natural (or assisted) migration and may fail to adapt to changing environmental conditions. Whether such populations have sufficient phenotypic plasticity to survive under changing conditions remains an open question.

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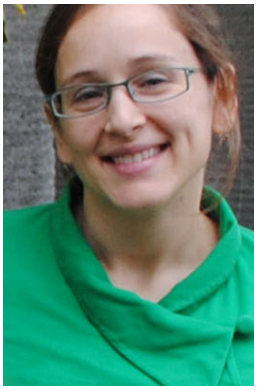
The Saas im Prättigau Valley where alpine populations of *A. thaliana* were studied, located at low (< 1000m) and high altitudes (>1700m). © Marie Roumet

Professor Clara Sánchez Rodríguez



The plant cell wall is a complex network of carbohydrate-based polymers that controls overall plant morphogenesis and protects the cell against biotic and abiotic stress factors. Among the cell wall components, cellulose is the main biomass contributor and is essential for several industries. One of the aims of our research is understanding the mechanisms underlying its synthesis and remodeling, especially those related with cellulose microfibril structure and its role in plant stress response. We are also interested in the cell wall as the first coat by which the cell communicates with its neighbour cells and the environment. To fulfil this function, the cell wall needs to be a highly dynamic and responsive structure, able to sense and integrate external stimuli and to transmit them across the plasma membrane. A fine-tuned communication with the cytosol through endocytosis is especially important for fast and localized responses, for example in reaction to microbes. In our group we aim to characterize the dynamic changes of the cell wall and the function of the endocytosis machinery at the cellular level, particularly in the microbe-plant interface.

Curriculum vitae

Clara Sánchez Rodríguez received her PhD in Agronomy in 2008 from the Polytechnic University of Madrid. Her PhD dealt with the study of the mechanisms regulating plant defence against pathogens. In 2008, she was awarded with different grants to move to the Max Planck Institute of Molecular Plant Physiology in Potsdam-Golm (Germany). There, she studied the molecular mechanisms of cellulose synthesis and clathrin-mediated endocytosis in plants. Her scientific achievements were honored with the Jeff Schell Award in 2014. Since 2015, Clara Sánchez Rodríguez is Assistant Professor for Plant Cell Biology at ETH Zurich where she will further investigate the role of the cell wall and endocytosis in plant stress response.

Clara Sánchez Rodríguez
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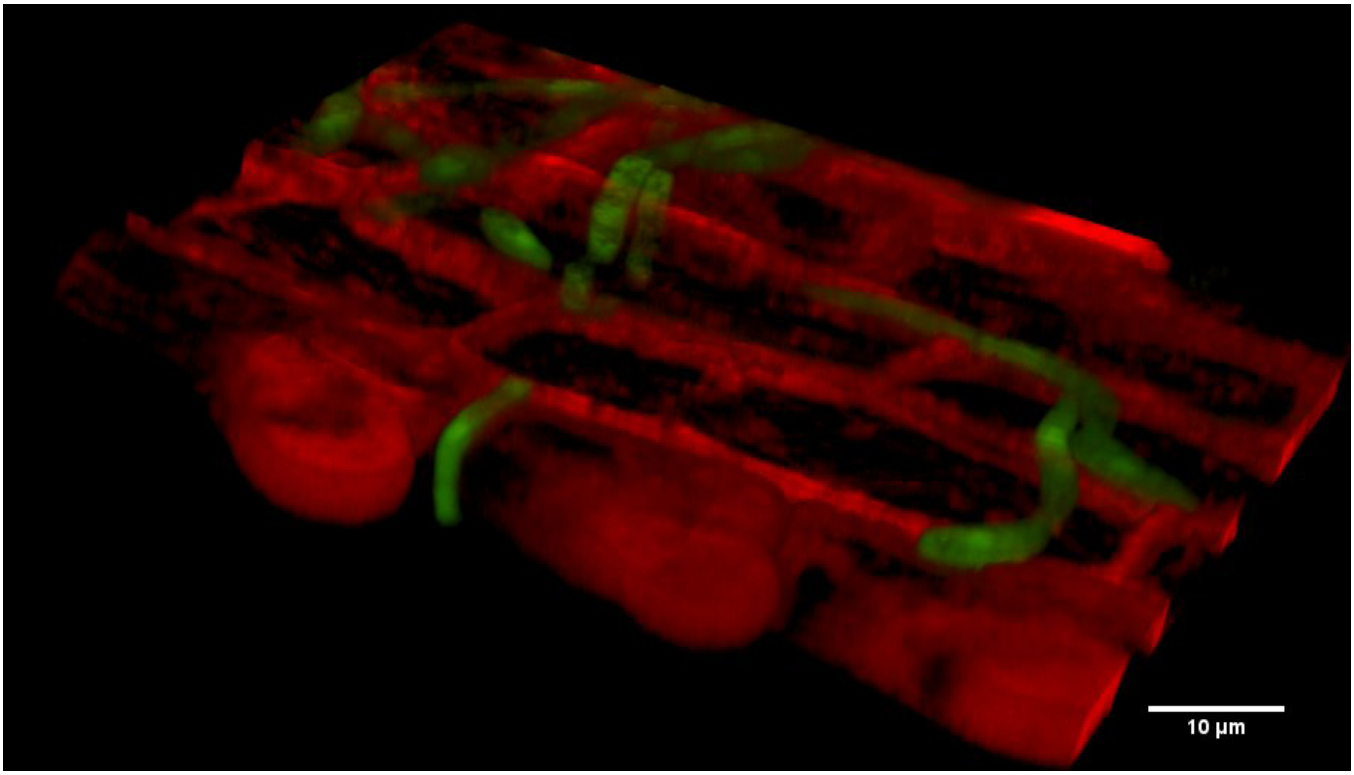
https://swissplantscienceweb.ch/research/home/portfolio/sanchez

3D-reconstructed confocal in vivo images of root response to pathogen fungus infection. Microtubule cytoskeleton re-organization (red) after sensing *Fusarium oxysporum* (green) intercellular penetration.
© Kamil Sklodowski and Clara Sánchez Rodríguez



Nature (2015)
doi: 10.1038/nature16192

Functional overlap of the *Arabidopsis* leaf and root microbiota

Bai Y, **Muller DB**, Srinivas G, Garrido-Oter R, **Potthoff E**, Rott M, Dombrowski N, Munch PC, Spaepen S, Remus-Emsermann M, Huttel B, McHardy AC, **Vorholt JA** & Schulze-Lefert P

Roots and leaves of healthy plants host taxonomically structured bacterial assemblies, and members of these communities contribute to plant growth and health. We established *Arabidopsis* leaf- and root-derived microbiota culture collections representing the majority of bacterial species that are reproducibly detectable by culture-independent community sequencing. We found an extensive taxonomic overlap between the leaf and root microbiota. Genome drafts of 400 isolates revealed a large overlap of genome-encoded functional capabilities between leaf-and root-derived bacteria with few significant differences at the level of individual functional categories. Using defined bacterial communities and a gnotobiotic *Arabidopsis* plant system we show that the isolates form assemblies resembling natural microbiota on their cognate host organs, but are also capable of ectopic leaf or root colonization. While this raises the possibility of reciprocal relocation between root and leaf microbiota members, genome information and recolonization experiments also provide evidence for microbiota specialization to their respective niche.

Nature Perspectives (2015)
doi: 10.1038/nature15744

Soil biodiversity and human health

Wall DH, Nielsen UN & **Six J**

Soil biodiversity is increasingly recognized as providing benefits to human health because it can suppress disease-causing soil organisms and provide clean air, water and food. Poor land-management practices and environmental change are, however, affecting belowground communities globally, and the resulting declines in soil biodiversity reduce and impair these benefits. Importantly, current research indicates that soil biodiversity can be maintained and partially restored if managed sustainably. Promoting the ecological complexity and robustness of soil biodiversity through improved management practices represents an underutilized resource with the ability to improve human health.

Nature Letter (2015)
doi: 10.1038/nature15374

Biodiversity increases the resistance of ecosystem productivity to climate extremes

Isbell F, Craven D, Connolly J, Loreau M, **Schmid B**, Beierkuhnlein C, Bezemer TM, Bonin C, Bruelheide H, de Luca E, Ebeling A, Griffin JN, Guo QF, Hautier Y, Hector A, Jentsch A, Kreyling J, Lanta V, Manning P, Meyer ST, Mori AS, Naeem S, **Niklaus PA**, Polley HW, Reich PB, Roscher C, Seabloom EW, Smith MD, Thakur MP, Tilman D, Tracy BF, van der Putten WH, van Ruijven J, Weigelt A, Weisser WW, Wilsey B & Eisenhauer N

It remains unclear whether biodiversity buffers ecosystems against climate extremes, which are becoming increasingly frequent worldwide. Early results suggested that the ecosystem productivity of diverse grassland plant communities was more resistant, changing less during drought, and more resilient, recovering more quickly after drought, than that of depauperate communities. However, subsequent experimental tests produced mixed results. Here we use data from 46 experiments that manipulated grassland plant diversity to test whether biodiversity provides resistance during and resilience after climate events. We show that biodiversity increased ecosystem resistance for a broad range of climate events, including wet or dry, moderate or extreme, and brief or prolonged events. Across all studies and climate events, the productivity of low-diversity communities with one or two species changed by approximately 50% during climate events, whereas that of high-diversity communities with 16–32 species was more resistant, changing by only approximately 25%. By a year after each climate event, ecosystem productivity had often fully recovered, or overshot, normal levels of productivity in both high- and low-diversity communities, leading to no detectable dependence of ecosystem resilience on biodiversity. Our results suggest that biodiversity mainly stabilizes ecosystem productivity, and productivity-dependent ecosystem services, by increasing resistance to climate events. Anthropogenic environmental changes that drive biodiversity loss thus seem likely to decrease ecosystem stability, and restoration of biodiversity to increase it, mainly by changing the resistance of ecosystem productivity to climate events.

Nature Genetics (2016)
doi: 10.1038/ng.3485

Hybridization of powdery mildew strains gives rise to pathogens on novel agricultural crop species

Menardo F, Praz CR, Wyder S, Ben-David R, Bourras S, Matsumae H, McNally KE, Parlange F, Riba A, **Roffler S, Schaefer LK, Shimizu KK, Valenti L, Zbinden H, Wicker T & B Keller**

Throughout the history of agriculture, many new crop species (polyploids or artificial hybrids) have been introduced to diversify products or to increase yield. However, little is known about how these new crops influence the evolution of new pathogens and diseases. Triticale is an artificial hybrid of wheat and rye, and it was resistant to the fungal pathogen powdery mildew (*Blumeria graminis*) until 2001. We sequenced and compared the genomes of 46 powdery mildew isolates covering several formae speciales. We found that *B. graminis* f. sp. *triticale*, which grows on triticale and wheat, is a hybrid between wheat powdery mildew (*B. graminis* f. sp. *tritici*) and mildew specialized on rye (*B. graminis* f. sp. *secalis*). Our data show that the hybrid of the two mildews specialized on two different hosts can infect the hybrid plant species originating from those two hosts. We conclude that hybridization between mildews specialized on different species is a mechanism of adaptation to new crops introduced by agriculture.

Scientific Integrity

Melanie Paschke

Guidance and training in responsible conduct in research is necessary not only to impart scientific integrity but also to offer orientation now that new scientific practices are being established in many fields. For example current authorship and publication practices are debated and changing, models of supervision vs. early independence are rethought, systems to assess scientific impact are contested, codes for management, access, analysis and presentation of large data sets are being developed and scientific results are challenged for their replicability in some fields. Life Science Zurich Graduate School is reacting. For all PhD students who have started their PhD after February 15, 2016 a two hour **Introductory Event on Research Integrity** will be mandatory. The event will be offered in summer 2016 for the first time. It is complemented by the PSC PhD course in **Responsible Conduct in Research** that prepares participants for making their own decisions in ethical ambiguous situations.

Start: March 17

information
www.plantsciences.uzh.ch/en/teaching/masters/responsibleconduct.html
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Frontiers in Plant Sciences

Tutorial on Plant Modelling
10 & 11 Mar 2016

This course aims to provide the basis for understanding computer modelling applied to plant sciences.

Population Genetics and Genomics of Adaptation

23 - 25 May 2016

The course provides a hands-on introduction to the study of plant adaptation with a focus on population genetics concepts and tools.

Applications of Stable Isotopes in Plant Sciences

27, 28 & 29 Jun 2016

This workshop offers insight into stable isotope applications to study plant and soil related research questions. It consists of interesting lectures and an exciting field visit.

Greenhouse Gas Fluxes - From the Soil to the Ecosystem scale

4 - 8 July 2016

This training school will consist of lectures and field work that introduces students the topic of greenhouse gas (GHG) fluxes, abiotic and biotic drivers, methodology while focusing on eddy covariance and chamber measurements.

Contact
Luisa Last, llast@ethz.ch

PhD Courses

Science & Policy: Evidence-based Policy Making
7 Mar & 7 Apr

Concepts in Evolutionary Biology
8 - 9 Mar

Responsible Conduct in Research
17 Mar & 21 Apr

Introduction to meta-analysis
4 - 8 Apr

Scientific Presentation Practice
15 & 20 May

Advanced Data Management and Manipulation using R
25 - 26 Apr

Introduction to UNIX/Linux and Bash Scripting
17 May

Next-Generation Sequencing 1 – Introductory Course: Assembly, Mapping, and Variant Calling
18 - 19 May

Next-Generation Sequencing 2 – Advanced Course: Transcriptomes, Variant Calling, and Biological Interpretation
23 - 24 May

Dealing with the Publication Process
3 & 21 Jun

Basic Plant Disease Diagnostic
6 - 8 Jun

Genetic Diversity: Analysis (ETH VVZ: 701-1425-00L)
13 - 17 Jun

Alpine Ecology - International Summer School on Alpine Plant Life
17 - 23 Jul

NEW! Science & Policy Workshops

Contributing to policy action – Analysis and communication of risks and uncertainties (2 ECTS)
30 May to 1 Jun 2016

The aim of this course is to understand the concept of risk and uncertainty in order to be able to improve the effectiveness of science in informing policy-makers. Students will learn how to communicate risk and uncertainty.

Scenario-building and modelling (1 ECTS)
13-15 Dec 2016

This 3 day workshop reflects on scientific conceptions and visions of the future. Students will test the scenario method, specific to foresight practices as well as the role and use of models.

Registration
http://spsw.registration.ethz.ch

Benefit from the PSC mentoring

PhD students and postdocs are welcome to join our mentoring that supplements the PSC training programs. Since 2015 our visits to various companies acting in the plant science sector offer the opportunity to meet and interact with representatives from human resources and from the R & D departments. Participants get a chance to present their research.

Industry visit

Sandrine Gouinguené

Ricola AG. The family-run company has its headquarters in Laufen, near Basel, Switzerland. Subsidiary companies are located in Italy, the UK, Asia and the USA. Ricola values high quality basic ingredients, in particular the herbs, which are cultivated in the Swiss mountains using natural farming methods. Take this mentoring activity as the opportunity to meet with Ricola scientists and HR representatives. Learn more about the plant use and transformation. This is a perfect occasion to network and discover new career paths in the plant industry sector. We will visit Ricola AG on 16th of June. Max number of participants: 15

© Ricola AG

NEW! Brown Bag Lunch

How to apply for a job in the industry – Bring up your questions and concerns
tbd, ETH Zurich, LFW B52, 12:30 - 13:30

You are planning to apply for jobs in the industry but you have questions arising and you do not have time or you do not know who to ask, then attend this event and get the answers!

Target audience
Postdocs and PhD students in the last year

Contact
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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 2016 it includes the Klimagarten 2085, teacher training workshops and a public round table.

Contact
info-plantscience@ethz.ch

NEW! Workshops

As part of the PSC postdoctoral career development and training

Diversity Management
24 - 25 May 2016, ETH Zurich, CLA J 1, 3, 5

How do you manage the diversity of staff in your research group, how do you deal with gender and cultural differences? How do you build a good working atmosphere to boost the performance of your group?

These questions will be answered by Dr Hilde Janssens (trainer & consultant in science, Austria) and Dr Monika Clausen (Dr Monika Clausen & Netzwerkpartner, Switzerland).

Target audience
Advanced postdocs, group leaders, starting group leaders and junior principal investigators.

Fee: CHF 200

How to prepare for an ERC grant application in 2017 with Switzerland as a Third Party

with Dr Andrea Degen, Eurelations AG

29 Mar 2016, 12-13:30, ETH Zurich

Registration
http://spsw.registration.ethz.ch

Klimagarten 2085 – A public experiment

1 Apr - 18 Sep 2016, Old Botanical Garden, Zurich

The Klimagarten brings climate scenarios to a tangible human temporal and spatial scale, and considers the role of science and culture in visioning our future green cities, landscapes and agriculture.

Juanita Schläpfer

How would a summer feel in the Swiss lowlands in 2085? What will our grandchildren grow in their gardens that year? For many people it's difficult to imagine what + 2 or + 4 degrees celsius difference will make to their local weather and vegetation. Communicating climate change is not only about facts but about how people relate emotionally to predictions and the cultural context of the information. The Klimagarten brings together expertise from plant sciences, humanities and arts to engage the public in events and dialogue around plants in a changing climate. In two greenhouses visitors will experience climate scenarios and learn how to measure abiotic stress factors on crop plants. Outside plots planted with the same crops will provide a comparison to today's climate. The art and trees tour developed with the Botanical Garden will lead visitors through the garden exploring tree species that will benefit from a warmer, drier climate and those which will lose species space. We have invited artists to create artworks engaging with trees on the list of «climate winners» and «climate losers» providing a multi-sensory experience of our changing climate. The installations will be supported by evening and lunchtime scientific talks; workshops for families, primary and secondary school classes; a documentary film series in conjunction with the Ethnographic Museum, and storytelling for all.

Public Program

Evening talks
Researchers from diverse fields of plant biology and ecology will give a short talk about their research in relation to climate change. A low-key, low-tech event, - no PowerPoint presentations - just researchers discussing plant science in the garden with a small group of Zurich citizens. Every second Thursday (18 - 19:00h).

For families
Special tours and activities for families will be on offer every Wednesday afternoon and some weekends. Everyone can learn how to reduce their carbon output through food and consumption choices. Activities range from crafty plastic up-cycling to fun with solar power and vegetable growing.

Primary school tours
Both the art and trees tour (3 - 6 class) and an age-appropriate (5 - 6 class) version of the CO_2 workshop are available for primary schools.

Secondary school workshops
See PSC Discovery workshops, to the right.

Lunch in the garden
Visitors can bring their sandwiches for a refreshing lunch break with one of our botanists who will guide them through the greenhouses or take them on a tour to experience climate change through art and a history of climatic change as told through stories of the trees. (every Wednesday 12:30h)

Storytelling
The Mini-theatre Hannibal is developing a new story just for the Klimagarten. Children of all ages will enjoy this climatic romp through the garden - involving plants and the animals that feed on them. See website for dates. Special performances can be booked by schools (3 - 5 class) and groups.

Documentary films
The first film in a documentary series shown in conjunction with the Ethnographic Museum will be The Marion Lake Story: Defeating the mighty Phragmite. This is the story of how a community rallied to restore their town's lake that had been become overgrown by an invasive species of reed. The Emmy-award winning filmmaker Greta Schiller will present her film on 21st of Apr 19:00h.
See website for further films:
www.musethno.uzh.ch/veranstaltungen/donnerstagskino.html

Art and trees
Taking the axiom that it requires both art and science to understand the world, we have created an art and botanical path through the garden, providing a multisensory experience in which to engage with trees and our changing climate.

Primary school workshops
The best snack box: Children can choose snacks (printed cards) based on the plant species in the garden. On the back of each plant card is information about how and where in the world that plant grows and how far it had to travel to get to them. (3 - 6 class)

www.klimagarten.ch

PSC DISCOVERY WORKSHOPS

PSC develops inquiry-based science education content for young people in secondary school classes – engaging with some of the latest innovations in plant science research. Three different workhops will be part of the Klimagarten 2085 public program.

Workshop: Understanding drivers of CO_2 exchange in a changing climate

with Nina Buchmann & Sabine Keller, ETH Zurich

The aim of the workshop is to investigate how plant stress affects the carbon uptake of plants after stress such as flooding or drought. The students will explore gas exchange between a crop plant and its environment using a carbon dioxide meter and a leaf porometer. They will measure CO_2 concentration changes and stomatal conductance of plants in the Klimagarten greenhouses and these results will be compared to streamed real-time measurements of gas exchange in a test crop plot in Oensingen.

Workshop: Biofertilizer - A win/win situation with fungi

with Lukas Schütz, University of Basel

Mycorrhiza fungi have been known for some time but only now and due to increasing energy costs and awareness of decreasing global phosphate deposits, is the potential of mycorrhizal fungi for agriculture being investigated. The aim of the workshop is to introduce students to the research on symbiotic interactions between plants and mycorrhiza and to explore how we can improve crop production by benefiting from this symbiosis.

Workshop: Plant breeding for the future

with Bruno Studer, ETH Zurich & Martina Birrer, Agroscope

The aim of this workshop is to explain (i) the concept of genomic selection and its potential to facilitate traditional and currently time consuming phenotype-based selection systems such as crossing, and (ii) How Marker assisted genome selection can contribute to select traits and phenotypes of crop species that will be adapted to a specific environment.

The PSC Discovery Workshops are financially supported by SNSF Agora.

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Expeditions & Camps

Familien Expedition
Alpenpflanzen – Ihr Leben und Überleben im Hochgebirge

6 - 7 Aug 2016

With Christian Körner & Erika Hiltbrunner, Unversity of Basel

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

Ort: Forschungsstation ALPFOR, Furkapass, Urner Alpen

Camp Discovery 2016
Abenteuer Wissenschaft –
Ein Ferienlager mit Experimenten zum Selbermachen

8 - 11 Aug 2016

With Juanita Schläpfer, PSC.

Zielpublikum: Junge EntdeckerInnen (3 -6 class)

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

Workshops for teacher

10 May 2016 – Plant Phylogeny

With Reto Nyffeler, University of Zurich and Carole Rapo, PSC. Life Science Learning Center, University of Zurich

21 May 2016 – Plant Ecophysiology

With Markus Fischer, University of Bern and Carole Rapo, PSC. Schweizerische Zentralstelle für die Weiterbildung der Mittelschullehrpersonen, University of Bern

Registration

http://spsw.registration.ethz.ch

PSC Fachtagung

New technologies for plant protection

8 June 2016, ETH Zurich

The conference is part of a conference series organized biannually by the PSC and the Collegium Helveticum. The aim of the conferences is to discuss the benefits of new plant science technologies and the resulting ecological, social and economic implications. Invited are scientists, farmers, journalists, policy makers, and the general public. The conference language is German.

09.30 Begrüssung **Manuela Dahinden**, PSC & **Thomas Hengartner**, Collegium Helveticum

09.40 **Eva Reinhard**, Bundesamt für Landwirtschaft BLW
10 Jahre Millennium Ecosystem Assessment Report: Der Pflanzenschutz bleibt eine Herausforderung

Session I: Neue Technologien und Ansätze für die Praxis

10.00 **Patrick Schweizer**, Leibniz-Institut für Pflanzengenetik und Kulturpflanzenforschung (IPK), Deutschland
Wirtsinduziertes Gen silencing – Resultat menschlichen Genies oder Mitfahrgelegenheit eines natürlichen Phänomens?

10.20 **Klaus Schläppi**, Agroscope, Schweiz
Das Pflanzenmikrobiom nutzbar machen

10. 40 **Markus Hardegger**, Bundesamt für Landwirtschaft BLW
Nanotechnologien im Pflanzenschutz

11.00 **Michael Thieme**, Universität Basel
Der mobile Teil des Pflanzengenoms als natürliche Ressource für die Sorten von morgen?

Session II: Genom-Editierung – das Potential von CRISPR/Cas

11.40 **Joachim Schiemann**, Julius-Kühn Institut, Deutschland
Sicherheitsbewertung und Regulierung neuer Pflanzenzüchtungstechnologien

12.00 **Johannes Fütterer**, ETH Zürich
Titel tbd

Session III: Wie lässt sich die gesellschaftliche Akzeptanz für neue Technologien erhöhen?

14.00 **Armin Grunwald**, Institut für Technikfolgenabschätzung und Systemanalyse ITAS, Deutschland
Transformative Wissenschaft und das Konzept der Technikzukünfte

14:20 **Georg Simonis**, FernUniversität Hagen, Deutschland
Anwendungsmöglichkeiten partizipativer Technologieabschätzung in der Politikberatung

Podiumsdiskussion

Isabel Hunger-Glaser, Eidg. Fachkommission für Biologische Sicherheit, **Sergio Belucci**, TA-Swiss, und tbd

Moderation: tbd

16.15 Schlusswort **Gerd Folkers**, Präsident des Schweizerischen Wissenschafts-und Innovationsrat SWIR

PLANT FELLOWS

23 Jun 2016 – Final Meeting
Old Botanical Garden, Zurich

This one day symposium is dedicated to present the outcomes of the PLANT FELLOWS programme, highlighting the scientific results of the 51 postdoctoral fellows. The symposium finishes with the solemny ceremony awarding of the PLANT FELLOWS Training Certification.

Detailed program
www.plantfellows.ch

Contact & registration
romy.kohlmann@usys.ethz.ch

PLANT FELLOWS

Effect of HIGS RNAi construct against Fusarium head blight © Patrick Schweizer, IPK, Germany

Registration
www.plantsciences.ch/outreach/conferences

Panel Discussion

Students of the PSC Science & Policy PhD Program will be involved in the panel discussion at the EUCARPIA General Congress: Plant Breeding, the Art of Bringing Science to Life

29 Aug - 1 Sep 2016, ETH Zurich

Innovation vs. regulation – Facilitating access to germplasm and release of innovative cultivars

A compromise has to be found between innovative breeding strategies and ensuring cultivar reliability for growers and consumers within the scope of a regulatory framework. Emerging new techniques in breeding make it necessary to review existing regulations along the production chain, taking into account the interests and concerns of a diverging range of stakeholders: breeders and other holders of intellectual property rights, variety testers, seed producers and merchants, farmers, consumers and environmental agencies. The keynote lecture by Richard Visser, future president of EUCARPIA, will be followed by short and concise opinion statements of important stakeholders and an open plenary discussion. Do not miss this special event which will terminate the scientific program of the congress!

http://eucarpia2016.org

Outlook

1 Dec 2016 – PSC Symposium
Plants for health – from research to application
Auditorium Maximum ETH Zurich

This year's PSC Symposium is being organized and implemented by a group of PhD students. International as well as national speakers will reflect on the role of plants and plant sciences on health while considering the fields of nutrition, medicine and environment.

Program & registration
www.plantsciences.ch/symposium

Low-resource Cassava field in Fortaleza, Brazil. The field did not receive irrigation, pesticides or fertiliser, and had yields of 10-15 tons per hectar
© Ezequiel Lentz, ETH Zurich

PSC Summer School 2016

Agriculture in Transformation: New Concepts for an Agriculture Production that is Socially Fair, Environmentally Safe and Economically Viable

11 - 16 and 19 Sep 2016, Zurich, Einsiedeln

Future demand in agricultural output is supposed to match the needs of 9 billion people with less input of resources. We want to address the question, if and how we can transform current agricultural practices and overcome existing paradigms to develop innovative and sustainable agriculture production systems. Students will discuss ideas, concepts and trends with stakeholders from federal agencies, NGOs, research and industry. Using current transition examples, we will explore, how these can be assessed at different scales in the dimensions of «socially fair», «environmentally safe» and «economically viable».

Selection of invited speakers:
Hans Herren, The Millennium Institute, Washington, USA
Franziska Stössel, ETH Zurich, Institute for Environmental Engineering, CH
Michel Griffon, AEI, Paris, France
Alan Buckwell, Institute for European Environmental Policy, Brussel, Belgium
Philipp Aerni, Center for Corporate Responsibility and Sustainability, University of Zurich, CH
Markus Frank, BASF Crop Protection, Limburgerhof, Germany

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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 Geography, University of Zurich
Department of Environmental Sciences, University of Basel

Zurich-Basel Plant Science Center, Coordination Office

www.plantsciences.ch