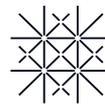




University of
Zurich^{UZH}

ETH zürich



University
of Basel

PlantScience*News*

Newsletter of the Zurich-Basel Plant Science Center

No 35, Spring 2019

A large, textured green brushstroke graphic that serves as a background for the word 'Response'. The stroke is thick and has irregular, feathered edges, giving it a natural, organic feel.

Response

Editorial

Launching the next phase of the PSC

The PSC is in its 5th renewal phase as a competence center. All three partner universities - the University of Zurich, ETH Zurich and the University of Basel expressed their gratitude while evaluating the Self-Evaluation Report 2015 – 2018 as well as the Strategic Development Report 2019 – 2022. We thank all members for their engagement. With over 600 members, the PSC is one of the largest competence centers in Switzerland. Currently, 37 professorships are involved: 19 from ETH Zurich, 3 (soon 4) from University of Basel, and 14 from University of Zurich. In addition, 58 group leaders, +175 postdoctoral fellows, +230 PhD students and +50 staff members in education, lab management are part of the network.

The PSC will continue initiating fellowship and research programs characterized by a strong and innovative nexus of training and outreach. Our vision is to increase the visibility of plant science research while contributing to the strategic profiles of our partner universities. Our focus topics include: sustainable development of environment and agriculture, digital transformations, land use and management, the protection and support of ecosystem services and biodiversity, the role of plant sciences in climate change mitigation and adaptation.

The PSC will further advance its higher education curricula in Responsible Research and Innovation, Science and Policy, Innovation Management and Open and Data Science. Both PhD programs "Plant Sciences" and "Science and Policy" continue to be excellent addresses for a PhD, including training and mentoring offers. The PSC sees itself as a mediator of socially relevant research topics and thus actively contributes knowledge to public and political discourse. The PSC has implemented various outreach formats that give our scientists access to target groups for the communication of their results into society. These formats include public round tables, expert conferences and workshop offers for school classes and out-of-school activities for children and adolescents. By integrating inquiry-based learning methods and combining art and science education, the PSC sets benchmarks for Switzerland's inormal education.

I am looking forward to my new role as the PSC president chairing a vibrant research network. My deepest thanks is dedicated to Samuel Zeeman for leading the PSC during the last 5 years – maintaining the excellency and pioneering work of the PSC. On 22nd of May, the PSC will organize a one-day retreat. In focus will be the curriculum of our PhD education, identifying needs and opportunities for further development. I welcome the opportunity to shape the next phase of the PSC with you.

Sincerely,
Bruno Studer, PSC Chair

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PSC Coordination office: **Melanie Paschke**, Managing Director Education, Finance and Fundraising; **Manuela Dahinden**, Managing Director Research, Communications and Fundraising; **Romy Kohlman**, Financial Administration and EU Project Coordinator; **Luisa Last**, Coordinator PhD Programs Plant Sciences and Science & Policy; **Aurélie Brehmer**, Assistant to the Managing Directors; **Juanita Schlöpfer**, Outreach Manager; **Ulrike von Groll**, Outreach Program Assistant; **Alexandra Rosakis**, Coordinator Plant Science at School; **Ute Budlinger**, *feminno* Program Coordinator; **Sylvia Martinez**, Coordinator Basel

RESPONSE — to society and policy needs through plant, food and energy sciences

The RESPONSE Doctoral Program (RESPONSE DP) will be co-funded by the European Commission (MSCA COFUND H2020). It aims to contribute to the EUs' coordinated efforts for stewardship in transformation to sustainable food systems, sustainable energy systems and to ensure sustainable land use.

PREANNOUNCEMENT

In December 2019, the PSC will launch its new PhD fellowship program RESPONSE DP. RESPONSE DP combines excellent inter-sectoral research with the empowerment of 35 new PhD students to interact with stakeholders, policy-makers and the public to make sure that research is responsive to the needs of society.

Research Topics

RESPONSE DP addresses challenges in the fields of sustainable food system, sustainable transitions in the energy sector and sustainable land use decisions. PhD students will benefit from the research environment of ETH Zurich, University of Zurich and University of Basel and the support of three competence centers: PSC, the World Food System Center and Energy Science Center.

Training

The RESPONSE DP research and training programme is unique, since PhD students will collaborate with a non-recruiting partner organisation at the science/policy/society interface or with a private organisation (enterprise) and will spend a mandatory secondment of 3 – 12 months. With their partner organisation and stakeholders, PhD students will co-create societally relevant and desirable research and innovation outcomes. Each PhD student will contribute to one Stakeholder Meeting and one Citizen Consensus Conference.

PhD students will be enrolled in the PSC Doctoral Programme "Science and Policy". They will be trained in different fields such as: communication of scientific evidence to policy-makers and the public; involvement of different stakeholder groups in a participative process to co-produce knowledge; policy development and endorsement in Europe and at global level; establishing contacts to policy-implementing organisations, industry, national and international NGOs, GOs and IGOs; and development of a high standard of scientific responsibility and responsiveness towards the needs of the public.

RESPONSE DP aims to become a flagship example of inter-sectoral research, underpinned with a dedicated training curriculum to foster awareness, know-how, expertise and competence in Responsible Research and Innovation (RRI).

The European Union will co-fund 35 PhD fellowships (each 36 months) with EURO 1935 per person-month (living allowance).

Contact: Luisa Last, luisa.last@usys.ethz.ch

DEADLINES

PUBLICATION OF 1ST CALL FOR PROPOSALS

(incl. templates and information on the PSC webpage)
May 1st, 2019

SUBMISSION OF RESEARCH PROJECT PROPOSALS

by PI to PSC
June 30, 2019

EVALUATION OF RESEARCH PROJECT PROPOSALS

by a selected Expert Panel
August 31, 2019

PUBLICATION OF JOB ADVERTISEMENT

by the PSC
September 1st, 2019

APPLICATION DEADLINE FOR PHD CANDIDATES

AND approval of co-funding
December 1st, 2019

EVALUATION OF THE PHD CANDIDATES

by Admission Committee & PI
December 2 to 15, 2019

ADMISSION INTERVIEWS

February 5 & lab visits on February 6 and 7, 2020

EARLIEST START OF THE PHD

March 2020

FELLOWSHIP AND PARTNERSHIP AGREEMENT

to be signed until 3 months after notification (May 2020)



This project will receive funding from the European Union's Horizon 2020 research and innovation program under the Marie Skłodowska-Curie grant agreement No 847585.

Real-time stable isotope models can predict the geographical origin of agricultural products

Florian Cueni, Daniel B. Nelson, Markus Boner, Ansgar Kahmen
University of Basel, DUW – Botany, CH, Agroisolab GmbH, Jülich, DE

Consumers are paying increasing attention to the geographic origin of food products. Analytical tools that allow for independent verification of the geographical origin of agricultural products are thus in high demand for food quality control. Stable oxygen and hydrogen isotope ratios describe subtle differences in the nuclear masses of these elements that can be used as a fingerprinting tool to distinguish otherwise chemically identical materials. In rainfall these values change with longitude and latitude and show an annual variability related to weather and climate (Dansgaard 1964; Bowen 2010). Plants use rainfall as a primary water source, and thereby incorporate and preserve a record of this spatial and temporal oxygen and hydrogen isotopic variability in their tissues.

Several descriptive tools based on stable isotopes are currently in use for origin analysis of food products. These typically rely on time-consuming and expensive collection of reference data sets and lack the capacity to account for inter-annual climate variability at a given location. For example, a warm/dry growing season one year and a cold/wet growing season in another year may produce oxygen and hydrogen isotope values in plant materials that are substantially different, even if the growing location is identical. This compromises the accuracy and universal applicability of this commonly applied approach. The introduction of novel physiologically-based stable isotope models may provide faster, cheaper, or more adaptive alternatives to predict the origin of agricultural products. However, the implementation of such models is complicated because detailed knowledge of how plant-environment interactions shape the stable oxygen and hydrogen isotope composition of a given crop is required for the application of these models.

In the context of the PlantHUB European Industrial Doctoral Program coordinated by the PSC, the objective of our project is to develop a web-based interface that allows probability estimates of the geographic origin of plant material for specific years based on a physiological isotope model using real-time climate data. This product will advance existing reference dataset-based origin analyses with more dynamic and widely applicable origin estimates. For this, an existing mechanistic plant physiological isotope model is modified by incorporating climate-driven variability in the oxygen and hydrogen stable isotope composition of precipitation, and climate-dependent physiological response func-

tions that affect how the oxygen and hydrogen isotope signal of precipitation is imprinted into organic materials of crop plants. With this, the model will be able to predict the oxygen or hydrogen isotopic signature of tissue water, bulk material, or specific compounds of agricultural products at a much advanced spatial and temporal resolution.

The plant physiological isotope model used in the project (plant-adapted Craig-Gordon Model) is a mathematical representation of the process leading to enrichment of ^{18}O and ^2H isotopes in leaf water (Dongmann *et al.* 1974; Farquhar and Lloyd 1993) and subsequently organic materials synthesized therein. While the model has previously been shown to accurately predict the hydrogen or oxygen isotopic composition of leaf water (Kahmen *et al.* 2008, 2011; West *et al.* 2008; Bögelein *et al.* 2017), the origin analyses of agricultural products rely on data from fruit tissue water or organic compounds of fruit and grains rather than direct leaf water data. A first task of the project is thus to experimentally determine if fruit tissue water is similar in its isotope composition to leaf water and if leaf water isotope modeling must be adapted for use with fruit tissue water. A second task of the project will be to identify the necessary steps to advance the model from leaf and tissue water to the simulation of O and H isotopes in organic compounds in fruits or other grains. The final task will then be to run the model with real time precipitation isotope and climate data to simulate the oxygen and hydrogen isotope composition of fruits and grains across the European continent. These model simulations will be validated by comparing simulated data against a unique and extensive database provided by our industry partner Agroisolab GmbH.

To identify the steps to advance the model from leaf and tissue water and to organic compounds in fruits or other grains, empirical studies have been conducted at the University of Basel. In a first experiment, sixty strawberry and sixty raspberry plants were grown in climate-controlled growth chambers at 30%, 50%, and 70% relative humidity, and the plants were irrigated with water with a fixed isotopic composition (Fig. 1). These experimental conditions permitted direct comparison of steps that alter oxygen and hydrogen isotope ratios in leaf and berry tissue water, and oxygen isotope ratios in leaf and berry bulk organic material under different water stress scenarios, thus mimicking different climatic conditions at the same geographic location. Additionally, outdoor field trials examining the most common crops grown in Europe were conducted in Botanical Garden of the University of Basel. Initial results from the empirical part of the project demonstrate that fruit tissue water is a

quantifiable and consistent mixture of leaf water that has been isotopically modified by transpiration, and irrigation water. Moreover, organic compounds in fruit and seeds show consistent offsets with the leaf water isotopic composition. The results obtained from these experiments are currently being used to refine the physiological isotope model to enabled continental-scale predictions of the oxygen and hydrogen isotopic composition of berry water. As indicated in Fig. 2, initial model simulations are highly promising.



Figure 1: Raspberries grown under controlled conditions in the University of Basel phytotrons.
© Cueni

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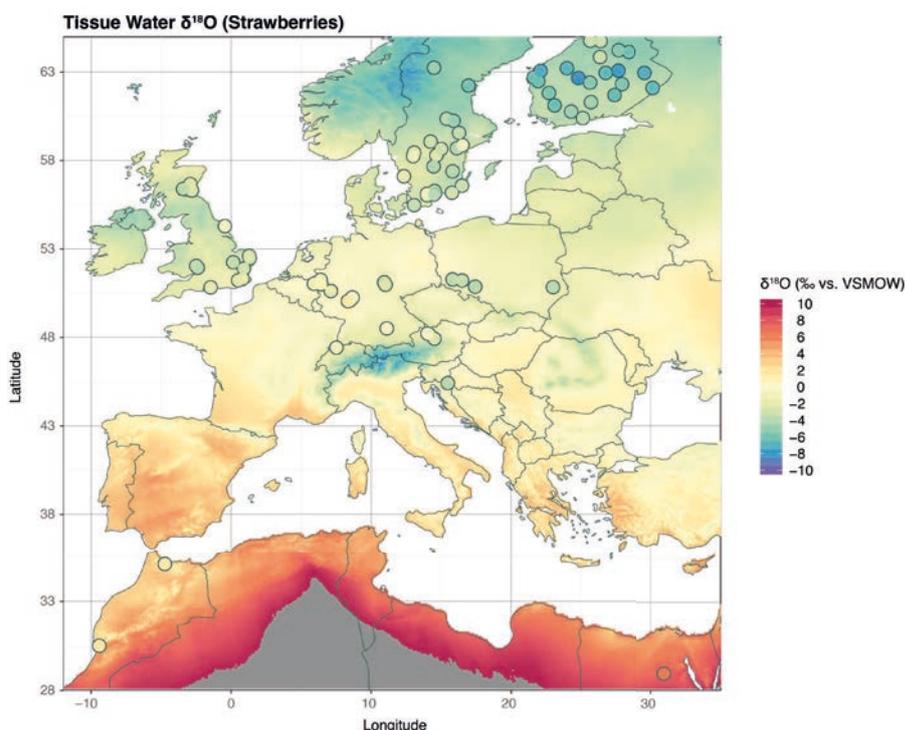


Figure 2: Strawberry tissue water oxygen stable isotope composition, for this example in Europe and Northern Africa (mean growing season 2007 to 2017). Points indicate strawberry tissue water oxygen stable isotope values of reference samples collected between 2007 and 2017
© Cueni



This project received funding from the European Union's Horizon 2020 research and innovation program under the Marie Skłodowska-Curie grant agreement No 722338 – PlantHUB.

www.plantsciences.uzh.ch/en/research/fellowships/PlantHUB.html

At a Glance

Open calls

COLLABORATIVE DOCTORAL PROGRAM

In 2017 the PSC submitted a proposal for a Collaborative Doctoral Program to the Joint Research Center (JRC). The JRC's mission is to support EU policy and decision-making. PSC has been selected and is now preparing collaboration agreements between ETH Zurich and JRC as well as University of Zurich and JRC. ETH Zurich and University can each host 5 PhD students in the topics "Soil and land use change" and "Bio-economy and forests". PhD candidates are jointly selected and supervised for the duration of their stay in the JRC (max. two years), they will be funded by the JRC. The PhD students will be enrolled in the PhD program Science and Policy coordinated by the Zurich-Basel Plant Science Center.

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

PARTICIPATIVE PLANNING OF RESEARCH: ENGAGE WITH SOCIETY

Application deadline: April 20, 2019 for social actors only

In ENGAGE with Society, societal actors and research groups decide together on the research question, the design of the research process, the products resulting from the gain of knowledge, or the effect that is to be achieved in order to generate solutions that are oriented to social needs. Social actors can apply to ENGAGE with a project. They formulate questions and needs for which they are looking for an answer or solution, and address them to PSC researchers. This can result in up to four projects, which the PSC then will propose to a well-known foundation for funding. If the funding decision is positive, the PSC will receive dissertation project(s) over a period of 4 years each. The initiators become research partners in the project. Research topics must be in the area of agro-ecological farming practices and alternative food systems, e.g., soil fertility, resilience through farming methods, smart farming and the application of technologies in heterogeneous, small-scale agricultural and horticultural systems, in niche production and in agro-ecological farming, diversification and agrobiodiversity or alternative food systems.

Who can apply? Swiss representatives of civil society organizations, e.g., associations, NGOs, environmental and agricultural interest groups, local and regional citizens' initiatives; representatives of the executive, environmental and agricultural offices at municipal to national level, regional tourism associations and farmers' organizations, can formulate their inquiry before April 20, 2019 on a maximum of 2 pages. The PSC will invite representatives of these organizations to an idea lab on May 10, 2019, 13:00 – 17:00. PSC researchers present their topics and provide starting points for working together on the topics mentioned.

The projects will be in German.

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PSC SYNGENTA FELLOWSHIP PROGRAM

Applications for PhD and postdoc fellowships can be submitted by November 1, 2019. The funds are intended to promote innovative research in plant sciences. Research co-operation within PSC will be an important criterion in the project selection. This call is reserved for PSC professors and group leaders.

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www.plantsciences.ch/research/fellowships/syngenta.html

Awards

Congratulations to those PSC members who rank among the Web of Science «**Highly Cited Researchers 2018**» as published by Clarivate Analytics: Environment/Ecology: **Jordi Bascompte**, University of Zurich and **Jonathan Levine**, ETH Zurich; Plant & Animal Science: **Enrico Martinoia** and **Cyril Zipfel**, University of Zurich; Cross-Field: **Nina Buchmann**, ETH Zurich; **Christian Körner**, University of Basel, and **Marcel Van der Heijden**, Agroscope & University of Zurich.

Consuelo De Moraes, ETH Zurich, has received the prestigious **Nan-Yao Su Award** for Innovation and Creativity in Entomology from the Entomological Society of America (ESA).

Class of 2018 AGU Fellow: Nina Buchmann, ETH Zurich, was recognized for her "visionary leadership and scientific excellence which have fundamentally advanced research in biogeosciences". This honor was announced by the American Geophysical Union.

Wilma Blaser received the **2018 SFIAR award** of the Swiss Forum of International Agricultural Research for her work on optimizing agroforests for development in West Africa (Johan Six group).

The fiat panis foundation selected **Christian Andres**'s dissertation "Transdisciplinary systems research to reduce the cocoa swollen shoot virus disease in Ghana" for the **Josef G. Knoll - European Science Award 2018**.

Corinne Hertäg gave the best PhD student paper presentation at The International Society for Chemical Ecology Annual Meeting, Budapest Hungary AND at 7th ECO PhD Symposium (Consuelo De Moraes group).

Tim Sykes, member of the Molecular Plant Breeding group and completing the PSC PhD Program in Science & Policy, was awarded with the "**Hans Vontobel Prize 2019**", a prize recognizing the quality, value and impact of this doctoral thesis at ETH Zurich in the field of Agricultural Sciences (Bruno Studer group).

PSC Symposium 2018 Poster Award
1st prize was awarded to **David Stähli** (*et al*), for his poster: Feasibility and adaptation of genome editing in *Malus domestica*. (Bruno Studer group);
2nd prize to: **Marta Björnson** (*et al*) for her poster: The transcriptional landscape of pattern-triggered immunity (Cyril Zipfel group);
3rd prize to: **Elizabeth Kastanaki** (*et al*) for her poster: Receptor-Like Protein Kinase 2 (RPK2) acts as a negative regulator of phloem identity in *Arabidopsis thaliana* (Antia Rodriguez-Villalon group).

Small RNA bidirectional crosstalk during the interaction between wheat and *Z. tritici*

This PhD project was supported by a PSC Syngenta fellowship under the supervision of Javier Palma-Guerrero at ETH Zurich (former PSC Plant Fellow) in the group of professor Bruce McDonald as well as under the supervision of Thomas Wicker at the University of Zurich.

Xin Ma & Javier Palma-Guerrero

The fungus *Zymoseptoria tritici* (*Z. tritici*) causes Septoria tritici blotch (STB) on wheat, which is the most damaging disease on wheat in Europe and leads to expenditure of \$1.2 billion each year for fungicides to control this disease. Recent transcriptomic analysis in this specific pathosystem provided the mutual responses between wheat and *Z. tritici* on the genome wide gene expression levels. But the epigenetic regulations of these plant and fungal genes remains largely unknown in this pathosystem. Previous studies of the interaction between *Arabidopsis* and the fungal pathogen *Botrytis cinerea* showed that the fungal sRNAs can silence plant defense related genes to suppress plant immunity. Conversely, plant miRNAs can also be transported into fungal cells and silence fungal effector genes to decrease the fungal

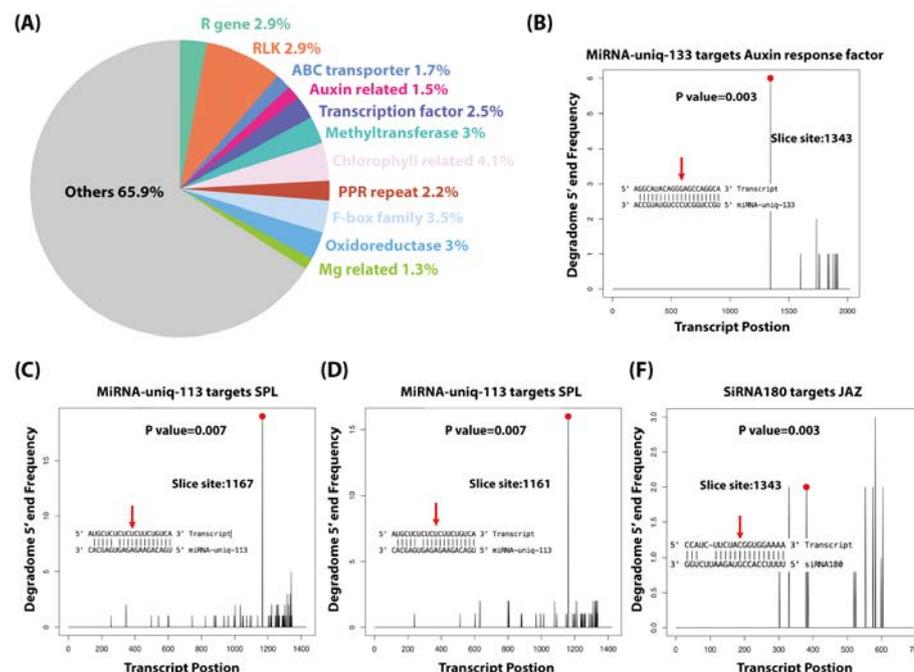
virulence. But the regulation of this cross-kingdom RNAi in the wheat-*Z. tritici* pathosystem was totally unknown. To fill this gap, we performed a detailed analysis of the sRNA bidirectional crosstalk between wheat and *Z. tritici* during the infection cycle.

We performed sRNA-seq from the fungal infected wheat leaves covering three key time points during the disease cycle to analyze both plant and fungal sRNAs. At the same time points we as well applied mRNA-seq and modified PARE-seq to study the expression and degradation of the predicted target genes in both wheat and *Z. tritici* transcriptomes. In total, we predicted 158 wheat miRNAs, 1120 wheat siRNA loci and 662 *Z. tritici* siRNA loci. But we did not find any clear evidence of a cross-kingdom RNAi in this pathosystem. During the infection, fungal sRNA enrichment was

lower than during in vitro growth, probably due to the low expressions of the only one Dicer gene in *Z. tritici*.

However, we found a downregulation of specific wheat sRNAs during the fungal infection, which led to a boost expression of wheat defense related genes and enhanced the wheat defense ability against *Z. tritici*. Moreover, we also found that specific wheat sRNAs can be induced during the pathogen infection. These wheat sRNAs regulate wheat genes expression, including auxin related genes and several transcription factors, as an immune response to the fungal attack.

Our study is one of the first studies to describe the bidirectional cross-kingdom RNAi in the interactions between wheat and *Z. tritici*. We confirmed that wheat can use sRNAs to regulate the plant defenses during *Z. tritici* infection. These findings contribute to improve our understanding of this pathosystem.



Contact

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Xin Ma, Nicolas Bologna, Javier Palma-Guerrero. Small RNA bidirectional crosstalk during the interaction between wheat and *Zymoseptoria tritici*. doi: 10.1101/501593

www.biorxiv.org/content/10.1101/501593v2

Figure: Wheat induces sRNAs to regulate wheat genes as an immune response against *Z. tritici*. (A) The functions of the wheat genes, which were downregulated and predicted to be targeted by wheat induced sRNAs. (B,C,D,E) Degradome analysis of the wheat genes targeted by miRNA-uniq-133, miRNA-uniq-113 and siRNA180.

Professor Cyril Zipfel, University of Zurich



© Bruederli, University of Zurich

Since June 2018, Cyril Zipfel is the new Chair of Molecular & Cellular Plant Physiology at the Institute of Plant & Microbial Biology of the University of Zurich. He moved there from The Sainsbury Laboratory in Norwich (UK) where he spent the last 13 years, first as a post-doctoral fellow of the European Molecular Biology Organization in the laboratory of Prof. Jonathan Jones (2005-2007), then Junior Group Leader (2007-2011), Senior Group Leader (2011-2018), and ultimately Head of the institute (2014-2018). Although originally from Alsace in France, his new position brings him back to Switzerland where he had performed his PhD (2001-2005) in the laboratory of Prof. Thomas Boller first at the Friedrich-Miescher Institute for Biomedical Research and then at the Botanical Institute of the University of Basel.

He is a recognized pioneer and leader in the field of plant innate immunity and plant signaling. His work is focused on understanding the molecular basis of plant innate immunity mediated by surface-localized immune receptors, as well as the application of this research to engineer disease resistance in crops. Since establishing his group in 2004, he has published over 120 papers, secured a Starting European Research Council (ERC) (2012-

2017) and a Consolidator ERC grant (2018-2023), has been a Thomson Reuter/Clarivate Analytics Highly Cited Researcher since 2014, was awarded the prestigious Charles Albert Shull Award from the American Society of Plant Biologists (ASPB) in 2015, was the first plant scientist to be awarded the Tsuneko & Reiji Okazaki Award from Nagoya University in 2018, and was elected Member of the European Molecular Biology Organization (EMBO) in 2018.

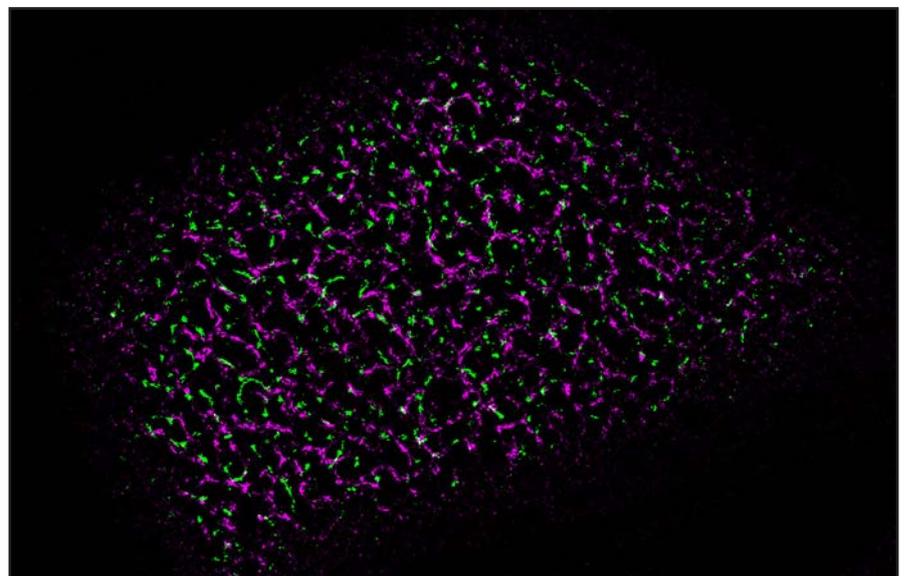
His work contributed to revealing the importance of pathogen-associated molecular pattern (PAMP) perception for plant immunity and the role played by the co-receptor BAK1 in the initiation of immune signaling. He connected pattern-recognition receptor (PRR) activation to immune outputs, and contributed to understanding how bacterial effectors inhibit PRR-mediated immunity for virulence. His group also discovered mechanisms that regulate the activity and formation of PRR complexes. His work uncovered the complex regulation of immune signaling initiation at the plasma membrane, and illustrated similarities to signaling mediated by Toll-like receptors in animals. His group frequently contribute to theoretical developments of the plant innate

immunity and plant signaling fields. In addition, his work has created biotechnological opportunities for PRR-based immunity to improve disease resistance in crops, resulting in significant interest from the crop genetics and seed industries.

With his move to Zurich, his group will further expand its interests in the molecular basis of plant receptor kinase-mediated signalling – not only during immunity, but also in response to other environmental stimuli as well as during growth and development. In particular, his group is becoming increasingly interested in understanding how plant signalling by receptor kinases is regulated by the dynamic organization of the plasma membrane, the properties and sensing of the cell wall, and endogenous peptides. Addressing these important fundamental biological questions require a wide range of approaches and techniques, which are offered by the interdisciplinary and stimulating scientific environment offered by the University of Zurich and the Zurich-Basel Plant Science Center.

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www.botinst.uzh.ch/en/research/plantsensing.html



Nanoclusters © Julien Gronnier

Nature (2018)

doi: 10.1038/s41586-018-0663-4

Phosphocode-dependent functional dichotomy of a common co-receptor in plant signallingPerraki A, DeFalco TA, Derbyshire P, Avila J, Séré D, Sklenar J, Qi X, Stransfeld L, Schwessinger B, Kadota Y, Macho AP, Jiang S, Couto D, Torii KU, Menke FLH & Zipfel C

Multicellular organisms use cell-surface receptor kinases to sense and process extracellular signals. Many plant receptor kinases are activated by the formation of ligand-induced complexes with shape-complementary co-receptors¹. The best-characterized co-receptor is BRASSINOSTEROID INSENSITIVE 1-ASSOCIATED KINASE 1 (BAK1), which associates with numerous leucine-rich repeat receptor kinases (LRR-RKs) to control immunity, growth and development. Here we report key regulatory events that control the function of BAK1 and, more generally, LRR-RKs. Through a combination of phosphoproteomics and targeted mutagenesis, we identified conserved phosphosites that are required for the immune function of BAK1 in *Arabidopsis thaliana*. Notably, these phosphosites are not required for BAK1-dependent brassinosteroid-regulated growth. In addition to revealing a critical role for the phosphorylation of the BAK1 C-terminal tail, we identified a conserved tyrosine phosphosite that may be required for the function of the majority of *Arabidopsis* LRR-RKs, and which separates them into two distinct functional classes based on the presence or absence of this tyrosine. Our results suggest a phosphocode-based dichotomy of BAK1 function in plant signalling, and provide insights into receptor kinase activation that have broad implications for our understanding of how plants respond to their changing environment.

Nature (2018)

doi: 10.1038/s41586-018-0563-7

Plant functional trait change across a warming tundra biomeBjorkman AD, ..., Schaepman-Strub G, ..., Iturrate-Garcia M, ..., Little CJ, et al

The tundra is warming more rapidly

than any other biome on Earth, and the potential ramifications are far-reaching because of global feedback effects between vegetation and climate. A better understanding of how environmental factors shape plant structure and function is crucial for predicting the consequences of environmental change for ecosystem functioning. Here we explore the biome-wide relationships between temperature, moisture and seven key plant functional traits both across space and over three decades of warming at 117 tundra locations. Spatial temperature-trait relationships were generally strong but soil moisture had a marked influence on the strength and direction of these relationships, highlighting the potentially important influence of changes in water availability on future trait shifts in tundra plant communities. Community height increased with warming across all sites over the past three decades, but other traits lagged far behind predicted rates of change. Our findings highlight the challenge of using space-for-time substitution to predict the functional consequences of future warming and suggest that functions that are tied closely to plant height will experience the most rapid change. They also reveal the strength with which environmental factors shape biotic communities at the coldest extremes of the planet and will help to improve projections of functional changes in tundra ecosystems with climate warming.

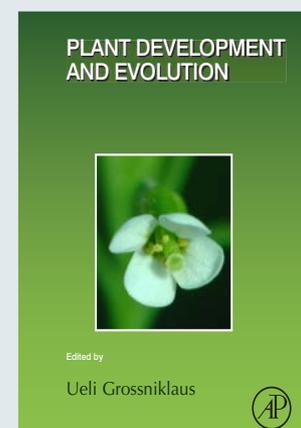
Nature Ecology & Evolution (2018)

doi: 10.1038/s41559-018-0708-y

A plant biodiversity effect resolved to a single chromosomal regionWuest SE, Niklaus PA

Despite extensive evidence that biodiversity promotes plant community productivity, progress towards understanding the mechanistic basis of this effect remains slow, impeding the development of predictive ecological theory and agricultural applications. Here, we analysed non-additive interactions between genetically divergent *Arabidopsis* accessions in experimental plant communities. By combining methods from ecology

and quantitative genetics, we identify a major effect locus at which allelic differences between individuals increase the above-ground productivity of communities. In experiments with near-isogenic lines, we show that this diversity effect acts independently of other genomic regions and can be resolved to a single region representing less than 0.3% of the genome. Using plant-soil feedback experiments, we also demonstrate that allelic diversity causes genotype-specific soil legacy responses in a consecutive growing period, even after the original community has disappeared. Our work thus suggests that positive diversity effects can be linked to single Mendelian factors, and that a range of complex community properties can have a simple cause. This may pave the way to novel breeding strategies, focusing on phenotypic properties that manifest themselves beyond isolated individuals; that is, at a higher level of biological organization.

Book**Plant Development and Evolution**
Ueli Grossniklaus (ed)

2019 Academic Press
Plant Development and Evolution
Volume 131, 1st Edition, 600 pages

eBook ISBN: 9780128098059

Hardcover ISBN: 9780128098042

www.elsevier.com/books/plant-development-and-evolution/grossniklaus/978-0-12-809804-2

PSC Frontiers in Plant Sciences

HOW TO VISUALIZE (BIG) BIOLOGICAL DATA SETS GENERATED BY OMICS TECHNOLOGIES

Lecturer: Prof. Dr. Kay Nieselt (University of Tübingen)

9 – 11 April 2019

Biological datasets increase in size and complexity. As a result, exploration of such data has become even more crucial than in the past. This course is for PhD students who are applying or planning to apply high-throughput technologies (in particular next-generation sequencing) and bioinformatics methods in their research.

PSC Science & Policy Courses

SCIENCE & POLICY WORKSHOP B: STAKEHOLDER ENGAGEMENT

Lecturer: Dr. Minu Hemmati, Berlin

18 – 20 Mar, Credit Points: 2 ECTS

During their work life, most life scientists will have to deal with issues relating to the development of their field, some of which may be subject to controversial debates in society and politics. Communicating and collaborating effectively across the boundaries and differences of various stakeholder groups and engaging constructively with representatives from government, business and civil society in multi-stakeholder processes are key competencies in this context.

SCIENCE AND POLICY COURSE: SCENARIO-BUILDING AND MODELLING

Lecturers: Véronique Lamblin (Futuribles), Claude Garcia (ETH Zurich)

1 – 3 Apr, Credit Points: 1 ECTS (not part of the Science and Policy curriculum!)

This 3-day workshop consists of two components highly relevant to scientific conceptions and visions of the future. The first day will focus on coupling modeling and scenario-building through a role-playing game experiment. Day two and three will focus on scenario-building organized around a practical workshop allowing students to test the scenario method, specific to foresight practices, through the exercise.

SCIENCE & POLICY WORKSHOP A: EVIDENCE-BASED POLICY MAKING

Lecturers: Daniela Eberli (University of Zurich), Eva Lieberherr (ETH Zurich)

Guests: Holger Gerdes (Ecologic Institute, Berlin), Susanne Menzel (Federal Office for Agriculture FOAG, Berne), Jerylee Wilkes-Allemann (ETH Zurich)

15 May & 3 Jul, Credit Points: 2 ECTS

The aim of this course is to develop skills and actions to improve the effectiveness of science in informing policy-makers. The lectures will introduce the concepts of environmental governance and evidence-based policymaking. In the case studies, you will study and evaluate concrete examples of policymaking. You will learn how scientific evidence is incorporated by investigating selected examples and processes.

PSC PhD Courses

Scientific Writing Practice II

4, 11 & 15 Mar

Get going with statistics in functional genomics

6 – 8 Mar

Responsible Conduct in Research

7 Mar & 9 May

Project Management for Research

21 Mar & 4 Apr

Concepts in Evolutionary Biology (BIO395)

1 & 2 Apr

Scientific Presentation Practice

9 & 22 May

Introduction to UNIX/Linux and Bash Scripting (BIO609)

20 May

Next-Generation Sequencing for Model and Non-Model Species (BIO610)

21 – 22 May

Dealing with the Publication Process

24 & 27 May

Advanced Data Management and Manipulation using R

6 – 13 Jun

Genetic Diversity: Analysis

17 – 21 Jun

Note: New URL

PSC course registration has moved to the ETH Zurich course registration system (Courses, continuing education):

www.ethz.ch/services/en/service/courses-continuing-education.html

Choose: Plant Sciences

Contact

psc_phdprogram@ethz.ch

Educational Retreat

22 May 2019, ETH Zurich, CLA J1

PSC looks back on 20 years of PhD and post-doctoral education, mentoring and career development. In order to continuously develop the curriculum of our two PhD programs, PSC constantly scouts for new technological developments and challenges in the field.

PSC seeks to incorporate up-to-date trends and the demands of the plant science community. We therefore invite all PSC members to jointly discuss and shape the 2019–2022 PhD programs in order to assure a training that allows participants to develop competencies adequate for 21st century plant science professionals.

This 1-day educational retreat consists of a keynote talk, discussions and workshops for members and student representatives to get insight into the current and future PSC offers that include training, mentoring and facilitating structures. Together, we will learn and discuss upcoming needs and opportunities for further development. It includes new initiatives and developments in PSC members' education offer and how PhD students can benefit. We will also try to find synergies to the PSC offer by discussing how the PSC can integrate them into the network-wide training programs.

Contact

Melanie Paschke, paschkme@ethz.ch



Alpine Plant Ecology
Summer School on Alpine Plant Life
 Swiss central Alps, 14-20 July 2019
 Erika Hiltbrunner, Christian Körner, Univ. Basel
 Jake Alexander, Univ. Lausanne
 Gianalberto Losapio, ETH Zurich

This graduate course is offered by the University of Basel and the Zürich-Basel Plant Science Center (PSC) for advanced biology students with basic plant science training. Course topics include microclimatology, ecophysiology, biodiversity, reproductive biology, vegetation and ecosystem ecology. The course will include lectures, field excursions and project work. Participation is limited to 24 students. Full board costs are CHF 400 (exclusive travel expenses).

Registration: PhD students register at franziska.grob@unibas.ch, at MOnA (Univ. Basel students) and PSC PhD students at PSC. Pre-registration (with motivation letter) until 28 February 2019. Acceptance information: 5 April 2019, confirmed registration: 29 May 2019.

Location:
 ALPFOR Alpine Research and Education Station
 Forka Pass, 2440 m a.s.l.
 Swiss central Alps

Further information:
<http://www.alpfor.ch/general.shtml>
<http://www.plantsciences.uzh.ch/en.html>

PROGRAM

10:00 *Welcome*

10:20 – 11:00

KEYNOTE by Dr. Hermann Lehner (Department of Computer Sciences, ETH Zurich)

Considering the importance of digitalization for current and upcoming plant scientists, the group will hear **“What are digital skill/competences required for PhD students and their subsequent career in the plant science?”** and subsequently discuss how to adequately incorporate them into teaching and coaching.

11:00 – 12:30

Break-out session 1 to capture new developments and required future skills / competencies for the 21st century in plant sciences.

12:30 – 13:30 *Lunch break*

13:30 – 14:30

Selected PSC members present their educational news

14:30 – 15:00

Wrap up: Overview of available PSC offers in PhD and post-doctoral education, mentoring and career development and ongoing curriculum developments.

15:00 – 16:30

Break-out session 2 to discuss and plan PSC educational offers considering needs.

16:30 *Apero*

CreativeLabZ — Launching a new science education program



With CreativeLabZ PSC is launching a new innovative science education program that aims to promote self-confidence, creativity, critical thinking, problem solving and leadership in youth. The core of the project is a series of six consecutive workshops on Wednesday afternoons and intensive week-long projects. Participants can engage in themes such as investigations of plant intelligence, growing food on Mars, building robots for plant care, bio-communication and soft robotics. The team of workshop facilitators consist of University of Zurich and ETH Zurich biology and environmental science students and Zurich University of Arts (ZHdK) art education students. The workshops' hands-on approach is an inquiry-based educative practice. Making or tinkering is important to MINT education as it embeds science and engineering in purposeful and valued activities, engendering MINT practice rather than MINT skills.

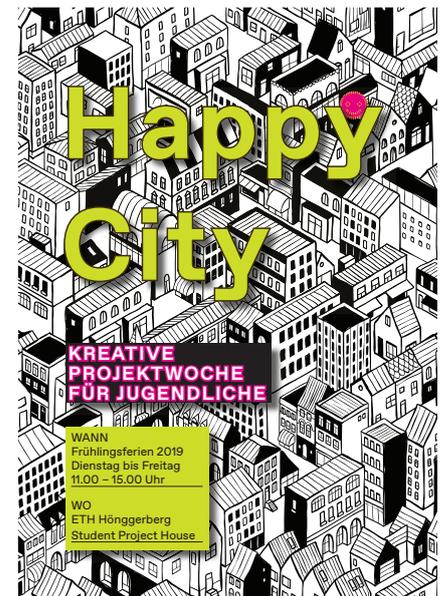
Through interdisciplinary connections of art, science and engineering, with a long engagement of several weeks, we hope to create substantive connections across MINT and the arts.

The benefits of learner-driven enquiry are well documented in science education literature and are based on the theory of making or 'doing' in a social context. Necessary for the success of this educational practice is a tripartite focus on tools, community infrastructure and tinkering-mindsets. A tinkering mindset is direct experience, experimentation and discovery. It is cognitively and socially richer than simply assembling a robot from a kit. Tinkering involves active testing and failing.

As project partners, PSC is lucky to work with the Museum for Digital Art (MuDa Zurich) and the ETH Zurich Student Project House. The first intensive week is during the spring break at the Student Project House, followed by six workshops in the makerspace of the MuDa. Participation is open to all but we aim to attract at least 50% of the participants from families with a non-academic background. This four-year project is supported by the Drosos Foundation.

creativelabz.ch

Upcoming



Contact

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Climate Garden 2085 exhibition moves on

The travelling art-science experiment from the PSC will be installed at the HSR Hochschule für Technik Rapperswil from April to July this year. We are looking forward to experiencing a version with a focus not only on horticultural crops but some of the trees and shrubs which are important to the landscape architects there. In order to build on the momentum of the Swiss teenagers' Klimastreik we offered a smaller version to high schools. The result was very positive with biology teachers from Gymnasiums from Zurich, Basel and Graubünden reserving the experiment for this year and Winterthur next spring. This means that several thousand high school students will have a close encounter with plants and climate change in a garden of the future.

www.klimagarten.ch

International Fascination of Plants Day @Olma 2019

On May 18th the world will celebrate the International Fascination of Plants Day to highlight the importance of plants and plant research for society's well-being.

This day is an excellent occasion to engage with the public and make people more aware of the essential role that plants have. 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.

plantday18may.org
swissplantsciencweb.unibas.ch/en/plantday

Contact
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The ETH Zurich stand at the 2018 OLMA was successful not only in terms of the sheer number of visitors who came to the tent - 149,000 - but we were able to count at least 16,000 visitors who engaged with activities at the stand for an average of ten minutes. With the involvement of the WFSC, D-USYS, D-HEST, D-ARCH we offered something for many interests and tastes. It generated good media coverage – mostly of the Bundesrat looking into a microscope. Partners such as the Migros, Bauernverband and the Landwirtschaftlicher Informationsdienst appreciated the participation of the ETH Zurich. The PSC will again be coordinating the stand in Oct 2019. The theme has not yet been decided, on the table are The Microbiome and Digital Agriculture. There is plenty of scope to participate if you are a doctoral student looking for an outreach project.

Contact
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Participate

in the PSC outreach programs to bring plant sciences and an interest in nature and technology to the public. There are plenty of opportunities for you to participate this year. There are no language barriers, since we have ways around that – you can help prepare experiments or workshops and there is always lots of essential support needed.

CLIMATE GARDEN 2085

April-June in FHS Rapperswil and various GYMIS (one in Muttens, BL), an exhibition about climate stress on agricultural and horticultural plants. We need several people to help give workshops on gas exchange and stomatal conductance.

SCHOOL CLASS WORKSHOP ON GENE EDITING

15 May, 13:20 – 15:00 KS Wetzikon; 22 May, 09:55 – 11:35, KME Zurich; 3 Jun, 14:25 – 17:00, KS Baden; 13 Jun, 09:35 – 11:10 KS Wattwil.

CREATIVE CAMPS

July, August and October: summer camps for children age 8 – 12 (German speaking necessary but must not be perfect!).

CREATIVELABZ

(all year): our new project for youth running in the Museum of Digital Art and the Student Project House of the ETH. Short talks from researchers are needed (also in English). Or you can come and tinker and help make stuff with us in the makerspace.

OLMA

October 2019: the PSC is coordinating this again and it would be fantastic if you would come and help with a workshop on plant science for families (German speakers).

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feminno

Career program for innovative women in Life Sciences

What is *feminno*?

The *feminno* program addresses women (PhD students and Post docs) at the crossroads between university and industry. PSC offers a comprehensive program consisting of innovation seminars, trainings and industry visits. We are interested in innovation, career opportunities and potential project partners. The program is coordinated by the Zurich-Basel Plant Science Center and supported by the Swiss Federal Office for Gender Equality for the period 2017–2019.

Industry visits – short concept

Industry visits offer a deepened insight into work and career opportunities in different companies outside of academia. The group analyses the situation with a focus on gender specific topics, working models and work opportunities in Research & Development. Furthermore, participants discuss their innovative ideas, and build a network. In personal encounters participants can establish new contacts for further collaborations. After a slow start in 2018 trying to find companies willing to welcome participants of the *feminno* program, the trend reversed and now companies are actively seeking contact to the program coordinator Dr. Ute Budliger. "For the program we are constantly looking for potential collaborations and seek to increase the number of experts who support the development of innovative ideas. But we have noticed that recruiting female talents seems to be of even greater interest to companies. In the past 12 months three participants found fantastic work opportunities in large enterprises as well as in a start-up company. And currently I see several new opportunities emerging also in terms of project collaborations".

A third mentoring round will start in June 2019.

Contact

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feminno participants presenting their business canvas © PSC

TESTIMONIAL

"It was especially interesting talking to the HR representative. She explained that we should be more self-confident about carrying the title of a postdoc and that we should not feel unwanted in industry. It was equally good to hear how a career consists of "turns and twists". Overall, the openness of the speakers and the glimpses they offered into their personal lives (especially J. Griffiths) helped me a lot in completing the picture I have of what it will be like to combine career and family."

Third Call

Opens on 1 March 2019

Closes on 30 April 2019

Notification of acceptance on 10 May 2019

Program duration: June–Nov 2019

Information and application form

www.plantsciences.uzh.ch/en/mentoring.html

Program

Career retreat

Three full day session: 4 – 6 Jun 2019

With Dr. Daniela Gunz, Career Services, University of Zurich

Innovation seminars

Four 4-hour evening sessions: 10, 17, 24 Sep & 1 Oct 2019: 18:00 – 22:00

With Andrea Gander, Apricon; Dr. Andrea Degen, Eurelations AG; Dr. Cornelia Fürstenberger, Unitecra; Prof. Marion Weissenberger-Eibl, Fraunhofer Institute for System and Innovation Research (ISI)

Training

o Innovation Workshop: Create a Business Model Canvas

Two full day sessions: 5 – 6 Aug 2019

With Isabelle Siegrist, Sandborn

o Negotiation skills for conflict situations and business deals

Two full day sessions: 14 – 15 Oct 2019

With Gaby Rockmann, Rockmann Consulting

Company visits and exploratory workshops

Four visits: June – Nov 2019 (Fenaco, BAYER, PWC, Syngenta)

Follow *feminno* on LinkedIn

Panel discussion

What's next after the EJC judgement on gene editing?

11 April, 16:00 – 17:30, Audimax ETH Zurich

As part of The Tri-National Arabidopsis Meeting (TNAM 2019) on April 10 – 12 2019.

The 200 participants take a tri-national view on the main issues and potential consequences of the ruling of the European Court of Justice (EJC) on organisms obtained by mutagenesis.

Invited guests

Holger Puchta, Karlsruhe Institute of Technology, DE

Armin, Spök, Graz University of Technology Science, Technology and Society Unit, AT

Anne-Gabrielle Wuest-Saucy, Federal Office of Environment, CH

Organizing Committee

Manuela Dahinden, Stefan Grob, Wilhelm Gruissem, Kinga Rutowicz, Clara Sanchez-Rodriguez, Diana Santelia, Kentaro Shimizu, Sara Simonini, Olivier Voinnet

PlantHUB 3rd Annual Meeting

19 – 22 Nov 2019, Copenhagen, DK

The consortium of the European Industrial Doctorate PlantHUB will meet this year in Copenhagen.

19 Nov – PhD Retreat + Integration Workshop: Efficient methods to detect marker-trait association, lead Prof. Bruno Studer, ETH Zurich

Visit to the Carlsberg Research Laboratory

20 – 21 Nov – PhD training workshop



This project received funding from the European Union's Horizon 2020 research and innovation program under the Marie Skłodowska-Curie grant agreement No 722338 – PlantHUB.

PSC Symposium 2019

Dec, Audimax ETH Zurich

You are most welcome to join the Scientific Committee of the 2019 PSC Symposium. This international symposium is organized each year and addresses trends and challenges in plant sciences. This is a wonderful opportunity to network and to put your topics of interest on the agenda. Your responsibility would be to: 1) brainstorm on trend setting topics, that are in interest to many PSC members; 2) suggest and invite speakers. The organisation of the Symposium will be done by the PSC.

Scientific Committee: Achim Walter and Tom Crowther (ETH Zurich), Anna-Liisa Laine and Alexander Damm (University of Zurich), Sylvia Martinez and Manuela Dahinden (PSC)

EUCARPIA

24 – 27 June 2019, ETH Zurich

The European Grassland Federation (EGF) and the European Association for Research on Plant Breeding (EUCARPIA) will hold their annual European scientific conferences for the first time as a joint symposium. The event stands under the slogan "Improving sown grasslands through breeding and management". The joint symposium will be hosted by Agroscope and ETH Zurich. The conference covers seven main topics organized in plenary and parallel sessions for offered oral and poster contributions. It includes a selection of mid-conference tours, and a workshop on Knowledge Transfer. The symposium will allow for intensive exchange of research ideas and knowledge, joining the two areas of forage crop breeding and grassland management.

www.egfeucarpia2019.ch

43rd New Phytologist Symposium
Interaction networks and trait evolution
 Zürich, Switzerland | 1–4 July 2019

Confirmed speakers:
 Alexander Bartsch, University of Zurich, Switzerland
 David Campbell, University of Cambridge, UK
 Peter H. Ravn, Aarhus University, Denmark
 Peter Jordan, University of Zurich, Switzerland
 Tracy Kline, University of Zurich, Switzerland
 Alberto Ferrero, University of Zurich, Switzerland
 Stefan P. Huber, University of Zurich, Switzerland
 John H. Thompson, University of Zurich, Switzerland
 Jacob Tyburk, University of Zurich, Switzerland
 Miguel Verdú, University of Zurich, Switzerland

Organizing committees:
 Florian P. Schaub, University of Zurich
 David Kopp, University of Zurich

Contact: Helen Probst-Davis, hprobst@newphytologist.org

www.newphytologist.org

www.newphytologist.org/symposia/43

SWISSPLANT 2020

29 – 31 Jan 2020, Ovronnaz

Scientific Committee: Heinz Müller-Schärer, Laure Weisskopf, Felix Mauch, Markus Geisler, Laurent Mene-Saffrane, Ora Hazak, Didier Reinhardt (University of Fribourg)



www.plantsciences.ch

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

ETH Zurich

Department of Environmental Systems Science
Department of Biology

University of Zurich

Department of Evolutionary Biology and Environmental Studies
Department of Geography
Department of Plant and Microbial Biology
Department of Systematic and Evolutionary Botany

University of Basel

Department of Environmental Sciences

Zurich-Basel Plant Science Center, Coordination Office

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Plant Fellows
PlantHUB
Feminno

BLOGS

www.klimagarten.ch
www.creativelabz.ch
blogs.ethz.ch/Science_and_Policy

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