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PlantScienceNews

Newsletter of the Zurich-Basel Plant Science Center

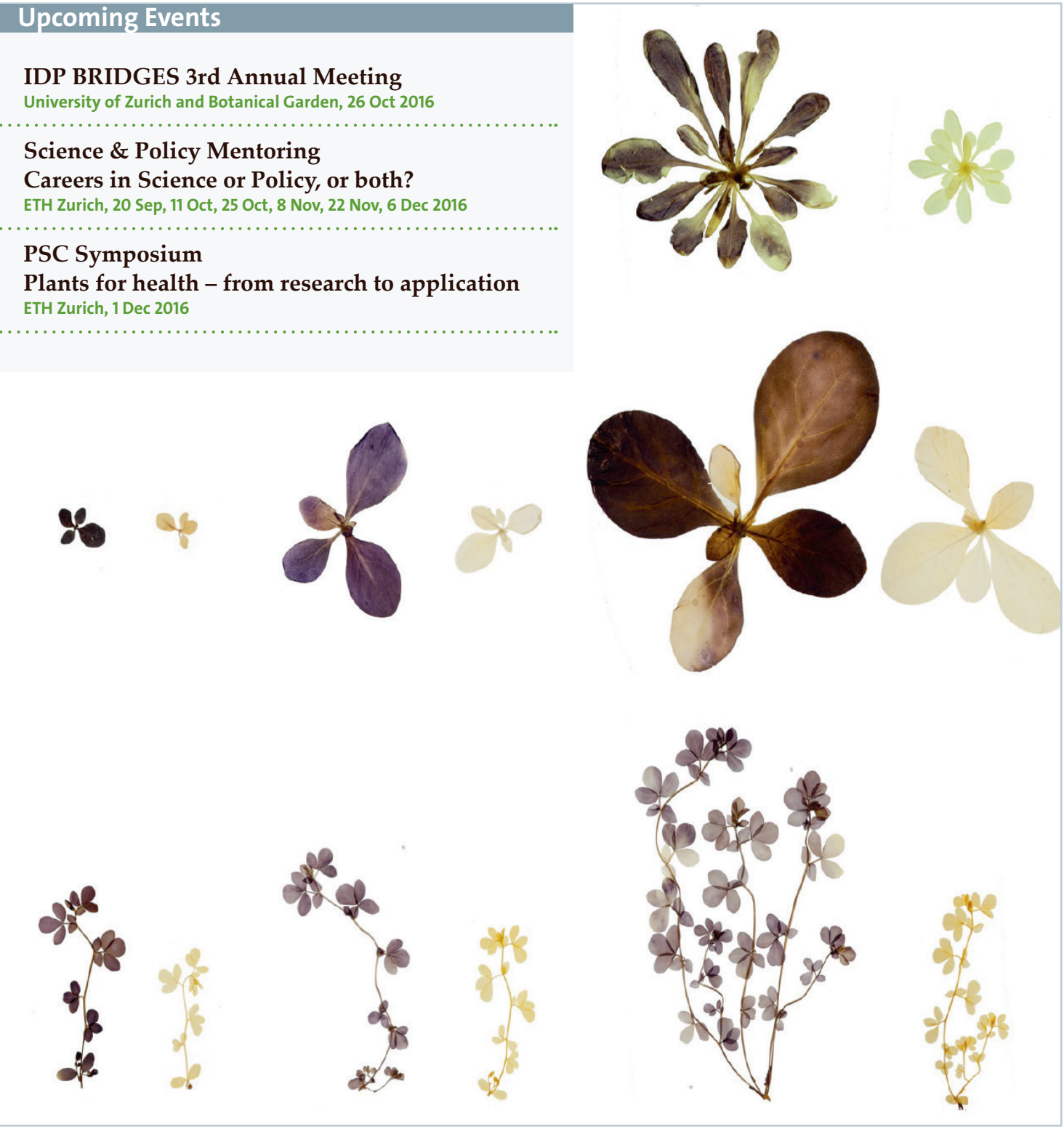
No 30, Fall 2016

Upcoming Events

IDP BRIDGES 3rd Annual Meeting
University of Zurich and Botanical Garden, 26 Oct 2016

Science & Policy Mentoring
Careers in Science or Policy, or both?
ETH Zurich, 20 Sep, 11 Oct, 25 Oct, 8 Nov, 22 Nov, 6 Dec 2016

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



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Cover picture
Michael A. Meier and Gavin George, ETH Zurich
Three plant species at different stages of development carrying a mutation in the plastidial phosphoglucomutase gene (light brown), which prevents the production of starch, stained with iodine compared to wild types (dark brown) at the end of the day.

Editorial

New technology is arriving faster than ever and holds the promise of solving many of the world's most pressing challenges such as adaptation to climate change and sustainable intensification of food production. In June the PSC organized a conference presenting latest technologies in use for plant protection to the public. The range of technologies included genome editing, RNAi defense, epigenetics microbioms and nanotechnology.

Whilst reflecting on latest public discussion about the use of new plant breeding technologies, we realized that as plant scientists we should promote a wide range of technologies and approaches to meet the expectations of society. Also, the access to new technologies and genetic resources is a major public concern which needs to be further discussed – incorporating moral and societal values such as sustainability and accountability. However, formats for stakeholder or public participation in research still need to be explored. Good role models are needed and most of all, financial resources.

Understanding how, and to what extent participative research can be conceptualized, configured, and distributed across such innovations and the complex systems in which they are embedded is the main objective of the new Innovative Training Network of the Zurich-Basel Plant Science Center. The Program is funded by the Marie Skłodowska Curie Actions of Horizon 2020. We will introduce the scope of this program within this newsletter. Enjoy reading!

Manuela Dahinden
PSC Managing director

Klimagarten 2085 © Nina Mann

At a Glance

Awards

Kentaro Shimizu (University of Zurich) received the 2015 NISTEP Award (The Researchers with Nice Step) from the Japanese Ministry of Education, Culture, Sports, Science & Technology for his significant contribution to science and technology, especially: «Elucidating the mechanism of rapid plant evolution in response to environmental changes by integrating molecular and organismal biology».

Bruno Studer (ETH Zurich) newly elected Associate Professor of Molecular Plant Breeding, won the 2016 «Günter and Anna Wricke Foundation» research prize for his achievements in forage crop genetics research.

Nina Buchmann (ETH Zurich) has become a member of the External Advisory Board of the Food Security Center at University Hohenheim, Germany (since 2016).

Ueli Grossniklaus (University of Zurich) is President-Elect of the International Society of Plant Molecular Biology. He will assume the presidency in 2018.

Silvia Dorn (ETH Zurich) has been appointed co-chair of the International Entomology Leadership Summit: Improving the Human Condition through Insect Science.

Mark Lendenmann (ETH Zurich) received the Hans-Vontobel-Award of the Vontobel foundation for his outstanding doctoral thesis in the area of agricultural sciences, ETH Zurich (Bruce McDonald group).

Steven Sylvester (University of Zurich) won the Prix de Quervain 2015 of the Swiss Academy of Sciences for his outstanding PhD thesis on high elevation environments (Michael Kessler group).

Rudolf Schlechter (ETH Zurich) received the Swiss Government Excellence Scholarship for Foreign Scholars (Clára Sánchez group).

Jonas Arnaiz (University of Basel) won a poster award at the 2016 Swiss Global Change Day in Bern (Erika Hiltbrunner group).

Kathrin Fuchs (ETH Zurich) won a poster award at the 2016 Swiss Global Change Day in Bern (Nina Buchmann group).

Call for Proposals

PSC- Syngenta Fellowship Program

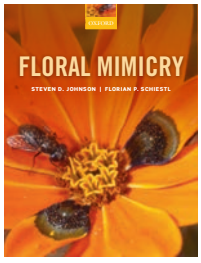
The PSC launches a new call for proposals under the PSC-Syngenta Research Fellowship Program. Applications for PhD and Post doc fellowships can be submitted until 1st of November 2016. The funds are intended to promote innovative research in plant sciences.
In addition to the scientific quality of the projects and the qualification of the applicants, research co-operation within PSC will be an important criterion in the project selection.

This call is reserved for PSC professors and group leaders.
For application templates please contact:
Manuela Dahinden
mdahinden@ethz.ch

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

Kentaro (third from left) among the NISTEP awardees © Japanese Ministry of Education, Culture, Sports, Science & Technology.

Book



Floral Mimicry
S. D. Johnson and F. P. Schiestl (eds)
Oxford University Press, Oxford. 2016
ISBN: 9780198732709

Boosting technology transfer and responsible research and innovation in plant sciences

PlantHUB is a new Innovative Training Network in the field of plant breeding and production.

Manuela Dahinden & Melanie Paschke

The skill and career development of young researchers is the heart of the PlantHUB program. The program will start in December 2016 and host 10 PhD students. The PSC will offer training in technical and research skills, technology transfer, innovation management, entrepreneurship, risk assessment, stakeholder and public engagement, and bioethics.

PlantHUB students will be enrolled at ETH Zurich, University of Zurich or University of Basel and will participate in the PSC PhD Program in Plant Sciences.

The students will spent 50% of the PhD time at one of the industry partners, including Carlsberg Group/Carlsberg Research Laboratory, Deutsche Saatveredlung AG, BaseClear BV, Agroisolab GmbH, Heliospectra AB and LemnaTec GmbH.

The research projects reflect on different angles of innovation in plant breeding and production. The expected outcomes are new molecular tools for plant breeding, new forage, cereal and oil crop varieties, non-invasive imaging and phenotyping technologies, intelligent lighting systems for plant growth, new software and services for complex genomic analyses, and plant product quality.

Applying Responsible Research and Innovation (RRI)

RRI is a transparent interactive process by which stakeholder incl. civil society and innovators become mutually responsive to each other with a view to the ethical acceptability, sustainability and societal desirability of the innovation process and the marketable products (first introduced by Von Schomberg). There are great hopes for RRI processes allowing us to develop technologies accepted and desired by society. By now, RRI is a key concept of the European research framework program Horizon 2020.

The PlantHUB training program will enable PhD students to take mutual responsibility for the processes and outcomes of research and innovation. This responsibility will be shared with different stakeholders in society, including the civil sector. Participants will work with their own case studies from their research projects and will apply RRI dimensions to their research. This will include:

DIVERSITY AND INCLUSION: understand the implementation of multi-actor and public engagement in the research process;

ANTICIPATION & REFLECTION: incorporate an analysis of values, needs and interests of stakeholders addressing ethical, social and environmental considerations; and

TRANSPARENCY & OPENNESS: capacity to transform research into implementation and create spaces for open science, open innovation or social innovation.

The outcomes will be presented during a summer school and final symposium.

PlantHUB is part of the PSC funding initiative: Responsible Research and Innovation in Plant Sciences. The initiative aims at developing a portfolio of research projects addressing ethical, legal, social or environmental considerations of plant science research for better acceptance and integration in society.

10 open PhD positions

PlantHUB currently offers 10 PhD positions. Interested PhD candidates are invited to submit their application through the online portal of the Life Science Graduate School Zurich. For requirements and details visit the PlantHUB website.

Deadline for application is 1 December 2016, contact:
Romy Kohlmann
romy.kohlmann@usys.ethz.ch

Link

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

PlantHUB is funded by the H2020 PROGRAMME Marie Skłodowska-Curie Actions Innovative Training Networks – GA No. 722338

Frontiers in Plant Sciences

BEST PRACTICE IN RENDERING DIGITAL IMAGES FOR PUBLICATION
By Dr. Bernd Pulverer

14-16 Nov 2016

ADVANCED COURSE ON 3D MICROSCOPY IMAGING OF PLANT TISSUES AND IMAGE PROCESSING
By Dr. Célia Baroux, Prof. Joop Vermeer, and Prof. Alexis Maizel

7-9 Dec 2016

The aim of this course is to obtain both an overview of available microscopy imaging solutions depending on applications, and a specific practice on confocal laser scanning microscopy imagining of Arabidopsis tissues using different mounting and clearing agents to learn how to customise the acquisition parameters towards maximum possible resolution.

ANALYSIS OF ECOLOGICAL DATA
By Dr. Sabine Güsewell

12-18 Jan 2017
Exam: 20 Jan 2017

This course will offer an overview of techniques for data analysis used in modern ecological research. Participants will gain practical experience in running these analyses with R and interpreting the results.

Contact

Luisa Last

llast@ethz.ch

PhD Courses

Scientific Writing Practice 1
Sep 23 & Oct 14, 2016

Seminar on Transdisciplinary Research for Sustainable Development
Sep 28, Oct 19, Nov 2, 16 & 31, 2016

Introduction to Political Sciences
Oct 3 & 5, 2016

Science & Policy: Stakeholder Engagement
Oct 17–19, 2016

Genetic Diversity Techniques
Nov 2 & 23, 2016

Sustainable Plant Systems
Nov 9 & Dec 8, 2016

Writing a Post-Doctoral Grant
Nov 22 & 24 Nov, 2016

Scientific Visualisations using R
Nov 28 & 29, 2016

Current Challenges in Plant Breeding
Nov 29, 2016 & Jan 31, 2017

Science & Policy: Scenario-building and modelling
Dec 13–15, 2016 (Hands-on training. Note: No Science & Policy Workshop!)

Introductory Course to R
Feb 21 & 22, 2017

Registration

http://spsw.registration.ethz.ch

PSC Colloquium Challenges in Plant Sciences

28 Sep & 3 Nov 2016, ETH Zurich

The colloquium Challenges in Plant Sciences is a fundamental element of the PSC's graduate programs. It links students with a broad spectrum of faculty and group leaders in the plant sciences, and introduces participants to the diversity of research fields. Group projects and presentations enrich the experience.

For Postdocs

Leadership Skills for Postdocs

by Dr. Olga Pardo, ETH Zurich, Human Resources, Personnel and Organizational Development and Dr. Benjamin Künzli, CLC Consulting AG, Zurich

6 and 7 Dec 2016, ETH Zurich

Registration

http://spsw.registration.ethz.ch

From our Fellows

A Pragmatic Approach to Getting Published: 35 Tips for Early Career Researchers

Natasha M. Glover, Ioanna Antoniadi, Gavin M. George, Lars Götzenberger, Ruben Gutzat, Kadri Koorem, Pierre Liancourt , Kinga Rutowicz , Krishna Saharan,Wanhui You and Philipp Mayer

Published in Frontiers in Plant Sciences, 2016
doi: 10.3389/fpls.2016.0061

Read more about the story behind the paper:
http://lab.dessimoz.org/blog/2016/05/10/publishing-tips-story
by Natasha Glover

Industry Mentoring

Sandrine Gouinguené

In June a group of 15 PhD students and postdocs visited the company Ricola in Laufen. The focus of the half-day visit was getting to know more about this family-owned company and gaining direct insight into the production of a world-famous brand. Today, Ricola produces herbal sweets for more than 50 countries on its site near Basel. The group visited the herb center where the plants are delivered and processed, as well as the production and packaging sites where plants are extracted and then processed to a sweet "snake" before being transformed into the final forms that we all know.

Ricola does not usually offer such a complete tour to visitors, we therefore, got a real treat. At the end of the day, our guide Dr. Martin Messerli, head of Corporate Operations & Innovation answered questions about employment at Ricola. Of course as a medium size company the job opportunities are more rare than in multinational companies. But PhD graduates would be eligible for management positions e.g. in regulatory affairs, at the Herb center and, of course, within partner institutions that collaborate with Ricola, like Agroscope located in Conthey where the research on herbs is mainly conducted. We would like to again thank Dr. Martin Messerli and Alina Kabas for their commitment to this event.

Most of the participants were impressed by the productivity of the company considering its size. The production unit with the storage of herb extracts and its capacity to deal with circumstances such as a reduced harvest season, really impressed the participants as it highlights how a company has to forecast and plan years into the future in order to maintain its production. Dr. Kelsey Byers' reply to the question «As plant scientist, would you consider such a company as a future employer?» was: "I admit that before the visit I hadn't thought about a company like Ricola as being in my research area (floral volatiles and pollination), but now I think that research & development at a company like Ricola would be a potential career option given my interest and knowledge in plant volatiles". After the visit, Rainer Boni said that he realized "…there are jobs but you need experience first".

www.ricola.com

Check PSC mentoring offers and Career Alerts!

www.plantsciences.ch/en/mentoring

Next Industry Visit

Frutarom, Wädenswil, Switzerland

7 November 2016

Established in 1933, Frutarom is a rapidly growing global flavor and fine ingredients company and is numbered among the ten leading companies in the world, in the field of flavors & fragrances.

www.frutarom.com

NEW! Science & Policy Mentoring

Careers in Science or Policy, or both?

Sep 29, Oct 11, Oct 25, Nov 8, Nov 22, Dec 6, 2016 (17.15 – 20.00), ETH Zentrum

This course offers a perspective on possible career paths at the interface of science with policy. Input-talks are followed by discussion rounds. Recent graduates from the PSC PhD program Science and Policy and other professionals will reflect on their career paths in government, politics, NGOs or private companies. In the discussions, we will elaborate with the speakers on what kind of skills, experiences and qualities are sought in the respective sector. We will learn what their responsibilities and impact are and what their working day looks like. The participants are invited to prepare questions. There will be good opportunities for networking.

GUEST SPEAKERS

Simon Briner
Federal Office for Agriculture FOAG

Franziska Humair
Federal Office for the Environment FOEN

Claudia Boelter
KWS SAAT AG

Sabine Perch-Nielsen
Ernst Basler + Partner

François Meienberg
Public Eye, Bern Declaration

Friedrich Wulf
Pro Natura, Friends of the Earth

Dominik Klauser
Syngenta Foundation

Eva Spehn
Swiss Biodiversity Forum, SCNAT

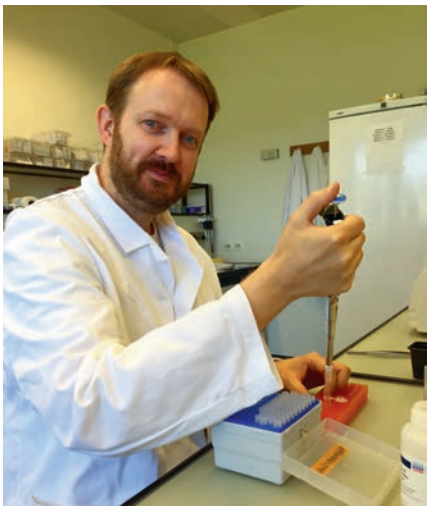
Michele Garfinkel
European Molecular Biology Organization EMBO

Thomas Marty
Berinfor AG

Mike Hoffmann
International Union for Conservation of Nature and Natural Resources IUCN

Claude Garcia
ETH Zurich, Agricultural Research Centre for International Development CIRAD

Professor Joop Vermeer



Intercellular communication is crucial for the development of an organism. It is mediated by biochemical gradients as well as by physical forces that collectively regulate differentiation and development. The root system of a plant is a central organ that regulates water and nutrient uptake from the soil, besides providing anchorage. Through controlled root branching (lateral root formation), plants have a means to explore their soil environment and to adapt to their soil environment. Lateral root formation is a developmental process in which the integration of chemical signals and physical forces is evident. Lateral roots are initiated deep within the primary root from dividing pericycle cells, necessitating growth through overlying endodermal, cortical and epidermal cell layers. During its development, the lateral root heavily depends on spatial accommodating responses of these overlaying cell layers. We have shown that pericycle cells need to swell in order to undergo formative divisions, whereas the overlying endodermis undergoes a dramatic volume loss during lateral root formation. Through manipulating SHY2-mediated auxin signaling in the endodermis, we were able to completely block cell proliferation in the pericycle. It appears that the pericycle perceives the non-accommodating endodermis as an increased resistance to its expansion growth. The pericycle-endodermis interaction provides a unique opportunity to elucidate the molecular and cellular mechanisms underlying spatial accommodation in plant development. We are using a multidisciplinary approach to elucidate their role during lateral root formation to give insight into the mechanistic framework underlying spatial accommodation. Recently, we have performed RNAseq to identify the SHY2-dependent targets that mediate spatial accommodating responses during lateral root formation. This has revealed that several transporters and ion channels (i.e SWEETs, MSLs, UMAMITs, aquaporins), but also regulators of the cytoskeleton, the cell wall and membrane trafficking are differently regulated in plants with a non-accommodating endodermis. The pericycle-endodermis interaction model is likely to provide fundamental new insights into other developmental processes that heavily depend on spatial accommodation by surrounding tissue(s). These include secondary growth, pollen tube growth and intracellular accommodation of symbionts.

Curriculum vitae

Joop Vermeer received his PhD in Molecular Cell Biology in 2006 from the University of Amsterdam (UvA). His PhD was conducted at the Section of Molecular Cytology at the Swammerdam Institute of Life Sciences (SILS) and addressed the development of novel ways to visualize membrane organization and phosphoinositide dynamics. After a postdoc at the Section of Plant Physiology (UvA-SILS) he investigated the role of phosphoinositides in plant stress and development. In 2010, he was awarded a Marie-Curie IEF fellowship and moved to the University of Lausanne, where he studied the role of the endodermis and the Casparian Strip in lateral root development. In 2015, Joop Vermeer was awarded a SNSF Professorship and is currently hosted at the Department of Plant and Microbial Biology were his group is further investigating the role of spatial accommodation during plant development.

Joop EM Vermeer, SNSF Professor
Plant Cell Biology
Department of Plant and Microbial Biology
University of Zurich

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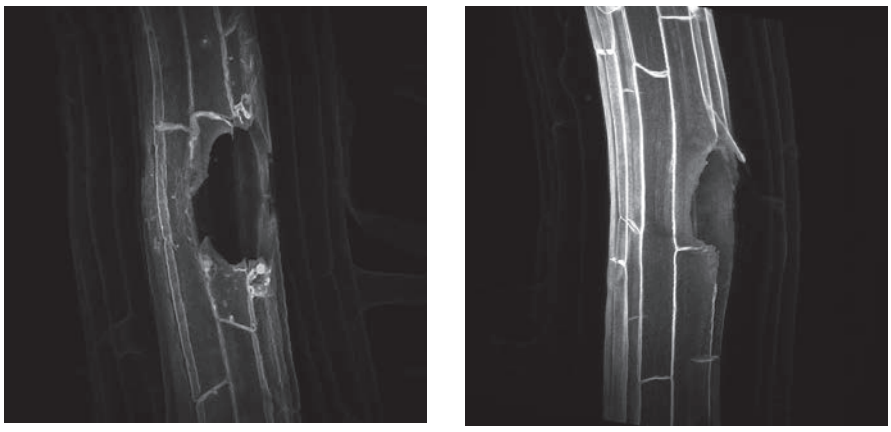


Remodeling of the tonoplast (left picture) and of the protoplast (right picture) of the endodermis to accommodate the growing lateral root primordium (not labeled).
© Joop Vermeer

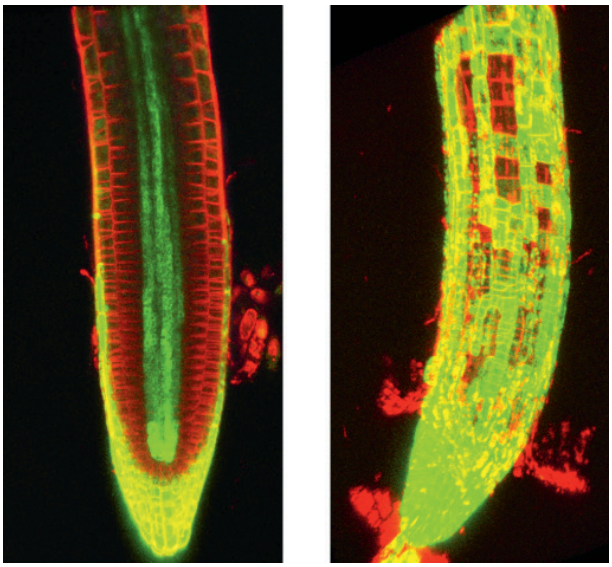
Transporter PUP14 confines cytokinin signalling responses

This research was part of Evelyne Zürcher's PhD thesis. It was funded by the PSC–Syngenta research fellowship program, and conducted under the supervision of Bruno Müller, Ueli Grossniklaus and Enrico Martinoia, all at the University of Zurich.

Evelyne Zürcher

Animal life on earth ultimately depends on plants - as primary producers and for their supply of oxygen. Remarkably, even a giant sequoia, one of the largest single-stem trees started life as a small seed. Using more amenable species, researchers have found phytohormones such as cytokinins to be instrumental in guiding the stereotypic but dynamic growth and patterning processes that determine plant morphology. Cytokinins constitute one well-described class of phytohormones. They trigger the activation of an intracellular signalling pathway that results in altered expression of target genes. The sites and stages at which cytokinin signaling occurs are precisely specified. Although regulated cytokinin metabolism is crucial to control local cytokinin levels, it alone cannot account for the spatio-temporal definition of signaling domains observed in planta. We hypothesized that the active ligands are differentially distributed within the plant and tissues, thereby establishing defined cytokinin signaling landscapes.

During my PhD, I could show that members of the Arabidopsis family of PURINE PERMEASES (PUPs), in particular PUP14, are involved in setting up these cytokinin distribution patterns. We have found that PUP14 is the most widely and abundantly expressed member, and its expression pattern displayed striking spatial complementarity to cytokinin signaling activities. In other words, cytokinin signaling is only allowed in the absence of PUP14. This may indicate that PUP14 inhibits cytokinin signaling, and we have generated PUP14 knockdown lines to unravel PUP14's effect on signaling. Using a synthetic reporter that visualizes cytokinin signaling activity, we have observed that plants with lowered levels of PUP14 display stronger and more broadly distributed signals indicating that PUP14 indeed limits signalling activity.



Cytokinin signalling activity (green) in the root tip of Arabidopsis seedlings. The picture on the left shows the signalling response in a wild-type plant carrying the cytokinin reporter. Upon loss of PUP14 function, additional cells activate cytokinin signalling. The cells' contours are shown in red.
© Bruno Müller

As cytokinin plays pivotal roles in development, we were not surprised to find that plants with low PUP14 levels visibly deviated from wild-type plants. Notably, the plants grow shorter roots but bushier shoots due to higher numbers of branches, which also carried more flowers. Transport assays revealed that PUP14 imports cytokinins into the cells, away from apoplastic sensing domains of the cytokinin receptors that would otherwise initiate the signaling pathway. Hence, PUP14 expression inversely correlates with the capacity of a cell to sense cytokinins, and PUP14 spatio-temporal activities cause region specific depletion of cytokinins from the apoplast. This clearance mechanism introduces a novel concept for regulation of a chemical signaling landscape. Interestingly, PUP genes are specific to vascular plants, suggesting that they might have supported the establishment of the more complex patterns of land plants.

Publications

E. Zürcher, J. Liu, M. Di Donato, M. Geisler, B. Müller

Plant development regulated by cytokinin sinks

Science 2016 Sep, 353 (6303): 1027-1030
doi: 10.1126/science.aaf7254

E. Zürcher, D. Tavor-Deslex, D. Lituiev, K. Enkerli, P.T. Tarr, B. Müller

A robust and sensitive synthetic sensor to monitor the transcriptional output of the cytokinin signaling network in planta

Plant Physiol. 2013 Mar, 161(3):1066-1075
doi: 10.1104/pp.112.211763

Contact

evelyne.zuercher@uzh.ch

Science (2016)
doi: 10.1126/science.aad6188

Belowground carbon trade among tall trees in a temperate forest

Klein T, Siegwolf R, Koerner C

Forest trees compete for light and soil resources, but photoassimilates, once produced in the foliage, are not considered to be exchanged between individuals. Applying stable carbon isotope labeling at the canopy scale, we show that carbon assimilated by 40-meter-tall spruce is traded over to neighboring beech, larch, and pine via overlapping root spheres. Isotope mixing signals indicate that the interspecific, bidirectional transfer, assisted by common ectomycorrhiza networks, accounted for 40% of the fine root carbon (about 280 kilograms per hectare per year tree-to-tree transfer). Although competition for resources is commonly considered as the dominant tree-to-tree interaction in forests, trees may interact in more complex ways, including substantial carbon exchange.

Genome Biology (2016)
doi: 10.1186/s13059-016-0972-6

Maybe she's NOT the boss: male-female crosstalk during sexual plant reproduction

Vogler H, Martinez-Bernardini A, Grossniklaus U

New insights into the molecular dialogue between male and female during sexual plant reproduction show that even plant sex does not work without clear communication.

Nature Biotechnology (2015)
doi: 10.1038/nbt.3318

Increased bioavailable vitamin B-6 in field-grown transgenic cassava for dietary sufficiency

Li KT, Moulin M, Mangel N, Albersen M, Verhoeven-Duif NM, Ma QX, Zhang P, Fitzpatrick TB, Gruissem W, Vanderschuren H

No abstract available.

Ecology letters (2016)
doi: 10.1111/ele.12601

Options of partners improve carbon for phosphorus trade in the arbuscular mycorrhizal mutualism

Arguello A, O›Brien MJ, van der Heijden MAG, Wiemken A, Schmid B, Niklaus PA

The mutualism between plants and arbuscular mycorrhizal fungi (AMF) is widespread and has persisted for over 400 million years. Although this mutualism depends on fair resource exchange between plants and fungi, inequality exists among partners despite mechanisms that regulate trade. Here, we use 33P and 14C isotopes and a split-root system to test for preferential allocation and reciprocal rewards in the plant–AMF symbiosis by presenting a plant with two AMF that differ in cooperativeness. We found that plants received more 33P from less cooperative AMF in the presence of another AMF species. This increase in 33P resulted in a reduced 14C cost per unit of 33P from less cooperative AMF when alternative options were available. Our results indicate that AMF diversity promotes cooperation between plants and AMF, which may be an important mechanism maintaining the evolutionary persistence of and diversity within the plant–AMF mutualism.

Molecular Biology and Evolution (2016)
doi: 10.1038/nprot.2014.198

Conserved but attenuated parental gene expression in allopolyploids: constitutive zinc hyperaccumulation in the allopolyploid *Arabidopsis kamchatica* as a quantitative trait

Paape T, Hatakeyama M, Shimizu-Inatsugi R, Cereghetti T, Onda Y, Tanaka K, Sese J, Shimizu KK

Allopolyploidization combines parental genomes and often confers broader species distribution. However, little is known about parentally transmitted gene expression underlying quantitative traits following allopolyploidization because of the complexity of polyploid genomes. The allopolyploid species *Arabidopsis kamchatica* is a natural hybrid of the zinc hyperaccumulator *A. halleri* and of the nonaccumulator *A. lyrata*. We found that *A. kamchatica* retained the ability to hyperaccumulate zinc from A. halleri and grows in soils with both low and high metal content. Hyperaccumulation of zinc by *A. kamchatica* was reduced to about half of *A. halleri*, but is 10-fold greater than *A. lyrata*. Homeologs derived from *A. halleri* had significantly higher levels of expression of genes such as HEAVY METAL ATPASE4 (HMA4), METAL TRANSPORTER PROTEIN1 and other metal ion transporters than those derived from *A. lyrata*, which suggests cis-regulatory differences. *A. kamchatica* has on average half the expression of these genes compared with *A. halleri* due to fixed heterozygosity inherent in allopolyploids. Zinc treatment significantly changed the ratios of expression of 1% of homeologous pairs, including genes putatively involved in metal homeostasis. Resequencing data showed a significant reduction in genetic diversity over a large genomic region (290 kb) surrounding the HMA4 locus derived from the *A. halleri* parent compared with the syntenic *A. lyrata*-derived region, which suggests different evolutionary histories. We also estimated that three *A. halleri*-derived HMA4 copies are present in *A. kamchatica*. Our findings support a transcriptomic model in which environment related transcriptional patterns of both parents are conserved but attenuated in the allopolyploids.

First set of Discovery Workshops are popular with school classes

Juanita Schläpfer

The PSC Discovery Program for Youth aims to highlight the trends of plant science research, convey a passion for its innovations and thus inspire the next generation of inventors, scientists and engaged citizens. Scientists from the PSC together with educators developed inquiry-based science education (IBSE) content for young people in secondary school classes.

During spring semester 2016 PSC taught the first four Discovery Workshops. Most of the school classes came from the Zurich area and two workshop were held in Basel.

The first workshop to be held was on 3D microscopy and was led by **Célia Baroux** (University of Zurich). The teacher was absolutely thrilled and wants to bring her next class.

The first pilot workshop on symbiosis was prepared by **Lukas Schütz** (University of Basel) and held in Basel and Zurich. The teacher had devoted at least two lessons to mycorrhizae and they students asked interesting and pertinent questions from the beginning.

The workshop on climate change designed with the group of **Nina Buchmann** (ETH Zurich), was held in the Klimagarten, our current exhibition in the Old Botanical Garden in Zurich. We ran the full Discovery Workshop with Gymnasium pupils and also shorter versions with several Sec A and Sec B classes. The exhibition was of course a perfect didactical support for the experiments as pupils could see the crops stressed condition and then measure stomatal conductance in situ. The experiments were developed with the expertise of **Sabina Keller** and led by her and **Susanne Burri.**

In June 2016, 24 students from Winterthur participated in the Discovery Workshopson SMART Breeding. The course was developed with **Bruno Studer** (ETH Zurich) and his group member **Martina Birrer**. During this workshop, the pupils worked with the model of perennial ryegrass (*Lolium perenne L.*) and its most important disease, crown rust (*Puccinia coronata f. sp. Loli*). After performing a PCR, the students analyzed the presence and absence of effective resistance genes in different genotypes of perennial ryegrass by using two High Resolution Melting curve analysis and Gel Electrophoresis. The workshop was a great success. At the end students gave a very positive feedback on the course and our evaluations of their knowledge confirms that they really understood the new techniques used in plant molecular biology. One of the highlights of this workshop was the passionate World Café we had, during which the students discussed in small groups the implications and relevance of this technology for society. It was clearly during these discussions that the students were able to see the link between plant sciences research, the development of new technologies and, innovation such as High Resolution Melting and how these tools can impact to secure food and reduce food waste.

During the autumn semester, PSC will offer six additional workshops on symbiosis and climate change. We will also develop three more Discovery Workshops on the following topics: metabolism, big data and adaptive evolution.

The PSC Discovery Program for Youth is funded by the Agora actions of the SNSF.

See the full list of discovery workshop offered at:
www.plantsciences.uzh.ch/de/outreach/at-school/discovery.html

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Impressions of the PSC Discovery Workshops as well as one example of the socalled Forscherhefte developed for each workshop
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PSC Symposium

Plants for health – from research to application

1 Dec 2016 | ETH Zurich | main building | auditorium maximum

09.00 Opening remarks by **Samuel C. Zeeman**, ETH Zürich and chair PSC

Session I: NUTRITION
CROP IMPROVEMENT FOR NUTRIENT ENHANCEMENT

09.15 **Herve Vanderschuren**, University of Liege, Belgium and ETH Zurich
Hidden Hunger: Seeking solutions with Staple Crops
10.00 **Dominique Van der Straeten**, University of Ghent, Belgium
tba
10.45 Coffee break

Session II: MEDICINE
PLANTS AS A RESOURCE FOR PHARMACEUTICALS

11.00 **Dirk Bosch**, Wageningen UR, The Netherlands
tba
11.45 **Judith Rollinger**, University of Vienna, Austria
Multipotent natural leads against respiratory tract infections
12.30 Lunch and poster session

Session III: ENVIRONMENT
POLLUTION MITIGATION THROUGHT PLANT SCIENCES

14.15 **Anette Pronk**, Wageningen UR, The Netherlands
A mass balance approach to quantify interception of fine dust (PM10) by trees
15.00 **Jean-Paul Schwitzguebel**, EPFL, Lausanne, Switzerland
Phytoremediation of contaminated soils: facts and challenges
15.45 Coffee break
16.00 **Karin Metzlaff**, European Plant Science Organisation, EPSO, Belgium
What and how can plant science contribute to society? How can you get involved?

Panel Discussion
Moving from plant-based to engineered products - ethics and public perception of synthetic biology

18.00 Poster awards and concluding remarks
18.15 Apéro

Program and online poster registration
http://psc2016.ethz.ch
Poster abstract submission deadline is 30 October 2016.
Admission is free of charge but registration is required.

Conference Committee
Rachel Begheyn, Devang Metha, Thomas Lanners, Tobias Löser (PhD students at ETH Zurich)
Noemi Peter, Song Sheng (PhD students at University of Zurich)
Luisa Last (Zurich-Basel Plant Science Center)