

NEWSLETTER

2010/18

Editorial



Photo: Manuela Dahinden

On July 7th, the first PSC–Syngenta Symposium took place. The Symposium is one of the gratifying outcomes of the long and fruitful collaboration between Syngenta and the PSC. I would like to add

that the interaction between the participants at the Symposium led to exciting suggestions on how to further enhance the collaboration. Following in the footsteps of Dr. Ramos (2003–2005), Dr. Goff (2005–2007) and Dr. DeRose (2007–2009), I now have the pleasure of evaluating, together with the other members of the PSC–Syngenta Advisory Board, the research proposals submitted by PSC members. I represent Syngenta's interest in the career development of young researchers, and I advise the research fellows on their progress, based on their annual reports. The next proposal submission deadline for this year is November 1st. Syngenta looks forward to supporting more innovative and cross-frontier research projects in the area of plant sciences.

Dr. Alain Gaume

Syngenta Crop Protection, Münchwilen AG

Awards

Thomas **Boller** was awarded the Dr. Rudolf Maag prize 2010. The Lotte and Willi Günthart-Maag foundation honored his outstanding achievements in the care and promotion of plants, as well as his great merits as a botanist and researcher in the field of plant immunity.

Christian **Körner** received the King Albert Gold Medal for Mountain Research for his outstanding contributions to mountain research.

Christophe **Praz** received the ETH medal for his excellent doctoral thesis in applied entomology (Silvia Dorn group).

Takashi **Tsuchimatsu** was awarded the Walter M. Fitch Prize of the Society of Molecular Biology and Evolution for his PhD research. He is currently a postdoc in the Kentaro Shimizu group.



Zürich – Basel
Plant Science Center



Universität Zürich



Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

Upcoming events

Plant Science and Policy Workshop: **Evidence-Based Policy Making. PSC PhD course.** *Sept 30 & Nov 10*

Books



Tropical Rain Forest Ecology, Diversity, and Conservation

Jaboury Ghazoul & Douglas Sheil. 2010. Oxford University Press, Oxford, UK. 516 pp. ISBN 9780199285884. Paperback and hardback.

This book introduces and explores diversity in rain forests, their evolution and functions, and human use of and impact on them. It contains a comprehensive and attractive introduction to tropical rain forest ecology and conservation, tackling the subject at local, regional, and global levels. The authors address the diversity of rain forest species and formation and explore new developments in forest ecology and conservation, as well as the role that these play in global climate and human livelihoods. Extensive case studies and text boxes illustrate key themes.



Restoration and History – The Search for a Usable Environmental Past

Edited by Marcus Hall (2009). Routledge, Taylor & Francis group, London, UK. 330 pages. ISBN 978-0-415-87176-1.

This book explores how a consideration of time and history can improve the practice of restoration. Restoration has a past, and the assumptions on which this past was based have political and social implications. Governments around the world are willing to spend billions on restoration projects without acknowledging that former generations have already wrestled with repairing damaged ecosystems, that there have been many kinds of ecosystems, and that there have been many ways of understanding such systems. This book aims to put the dimension of time back into our understanding of environmental efforts. A collective answer is given regarding the conditions that should be restored – and it is not a unified answer.

RESEARCH

First PSC-Syngenta Symposium



Guided tour through the Syngenta Seed Care Institute™.



All photos on this page: Manuela Dahinden

Christian Sailer, Hsiang Chun Lin and Dirk Blom presented their projects.

On July 7th, Syngenta invited all research fellows and their project leaders to the Syngenta Crop Protection Research Center in Stein Säckingen (AG). With more than 40 participants attending, the symposium was a great success. The day was filled with lively discussions and interesting excursions. Syngenta expressed its desire to enhance the level of interaction with the PSC and the visibility of the collaboration within both organizations.

Three new research projects started earlier this year. **The new fellows are** Sylvan Bischof, David Kradolfer and Christian Heichinger.



Sylvan Bischof graduated from the University of Neuchâtel. Sylvan did his PhD in the Wilhelm Gruissem lab at ETH Zurich, working on the chloroplast proteome assembly, using mass-spectrometry based proteomics. In April 2010, he joined Sam Zeeman's lab to study enzymes involved in the starch biosynthetic pathway. One of the aims of his Syngenta-funded project is to elucidate the molecular mechanisms that allow the tropical tree *Cecropia peltata* to synthesize glycogen (the glucose storage compound in animals and microbes) rather than starch.



David Kradolfer obtained a masters in Genetics at the University of Zurich. Last year, he started his PhD in the Claudia Köhler lab at ETH Zurich, where he is studying the seed and pollen development of *Arabidopsis thaliana*. As part of the Syngenta-funded project, David is screening for new genes involved in the formation of unreduced (diploid) pollen. Unreduced pollen is very useful for plant breeding, as it facilitates the crossing of plants of different ploidy, which is a common problem in the breeding of crop plants.



Christian Heichinger studied Molecular Genetics at Sussex University in Brighton and obtained his PhD at Cancer Research UK (University College London). After two years of postdoctoral studies at the Rockefeller University in New York, he joined Ueli Grossniklaus's lab at the University of Zurich. In the project funded by Syngenta, Christian is investigating epigenetic changes in the annual plant *Arabidopsis thaliana* after five generations of selection in dynamic landscapes. The aims are to identify specific loci that are regulated epigenetically and to integrate the findings with phenotypic observations.

EDUCATION / (PS)₂A

PhD Program in Plant Sciences, Spring 2010

- SciEvidence-based Policy-making in Plant Sciences, Sep 30 & Nov 10
- Scientific Writing I, Oct 1 & 22
- Writing a Post-doctoral Grant, Oct 4 & 5
- Self-marketing Skills – Indispensable to Boost your Career (Block Course), Oct 11–12
- Radio-isotopes in Plant Nutrition, Oct 1, 15, 22, 29; Nov, 12 & 19; Dec 3
- An Introduction to Data Analysis for Biologists Using R, Oct 18–19 & 25
- The Successful Start of a Business Career, Nov 15 & 16
- Computational Biology (Block Course), Dec 1–3
- Analysing Plant Growth: Non-linear Regression and Mixed-model Effects, Jan 12 & 13, 2011.
- Introductory Course to R, Jan 24–26, 2011.
- Stable Isotope Ecology of Terrestrial Ecosystems, Jan 24–28, 2011

(PS)₂A



Current members of the (PS)₂A (from left to right): Gurbir Singh Bhullar, Walid Mahrez, Monica Welc, Heike Lindner, Michael Raissig, Stefan Herwig.

The Plant Science PhD Student Association

The main aim of the (PS)₂A Association is to represent the PhD students within the PSC. By organizing scientific and social events, we provide opportunities for our members to meet PhD students from the various PSC member institutes. We aim to facilitate academic and social exchange and encourage student identification with the PSC.

At present, the (PS)₂A comprises only the six committee members of the PSC PhD Symposium that are organizing this year's student conference. This limits the activities of our association, so we would like to encourage PhD students from all member institutes to join.

By becoming actively involved with the (PS)₂A, you will gain experience in project management and will make interesting contacts. In addition, those who become a member of the board or of the symposium organization committee will receive credit points. Organizing events like the symposium, excursions and parties is not only enjoyable; it also gives you the opportunity to shape PSC life.

If you are interested in joining the (PS)₂A Association, please contact us!

We look forward to meeting you.

Your PhD student association

Contact: PSCsymposium2010@ethz.ch



Bekämpfung des Feuerbrands in der Schweiz. Traditionelle Lösung oder Gentechnik? (Proceedings Grüne Gentechnologie 2008)

Idea-Verlag 2010
ISBN: 9783887932565

For book orders (CHF 15/copy) contact: info@plant-science.ethz.ch

Der Feuerbrand hat 2007 in der Schweiz stark gewütet: Über 100 Hektaren Niederstammkulturen und rund 40 000 Hochstammbäume mussten gerodet werden. Dies hat die Existenz vieler Obstbaubetriebe bedroht. Feuerbrand ist eine epidemische Bakterien-erkrankung von Apfelgehölzen und verwandten Arten. Seine Bekämpfung auf konventionellen Weg (Niederbrennen von befallenen Bäumen, gross-flächiges Besprühen mit Antibiotika oder Kupferpräparaten) ist mit Risiken für Umwelt, Biodiversität und Gesundheit verbunden. Der alternative Lösungsweg der Feuerbrandbekämpfung mittels Gentechnik wurde bisher in der Schweiz nicht befürwortet. Gegenstand der Tagung war, ob die Gentechnik Lösungen für die Bekämpfung von Feuerbrand bereitstellen kann.

SCIENCE HIGHLIGHTS

Science 327:1461–1462 (2010)

Phenology Under Global Warming

Körner C, Basler D

In response to global warming, spring events such as bud burst and flowering have advanced several days per decade at temperate latitudes. As global warming progresses, how will it affect the arrival of spring and the length of the growing season? An advance in leafing of a few days during warm years may not be simply extrapolated into a proportional lengthening of the growing season. The reason for this is that the most important factors controlling phenology in dominant forest trees are not only temperature but, more importantly, also the degree of winter chilling and photoperiod (day length relative to night length). Bud burst and flowering will thus not continue to track climatic warming (the lengthening of the potential growing season) but will increasingly become constrained by internal controls as the photoperiod threshold (set by genes) is approached. For most extratropical, late successive trees, seasons will therefore not become substantially longer until new genotypes emerge. On the other hand, ecosystem nutrient losses are a potential consequence of trees getting out-of-phase with the climate system. Climatic warming should thus not be seen as a self-evident cause for more tree growth.

PSC website

www.plantscience.ethz.ch
www.plantscience.uzh.ch
www.plantscience.unibas.ch

Nature 464:1342–45 (2010)

Evolution of self-compatibility in *Arabidopsis* by a mutation in the male specificity gene

Tsuchimatsu T, Suwabe K, Shimizu-Inatsugi R, Isokawa S, Pavlidis P, Städler T, Suzuki G, Takayama S, Watanabe M, Shimizu KK

Ever since Darwin's pioneering research, the evolution of self-fertilisation (selfing) has been regarded as one of the most prevalent evolutionary transitions in flowering plants. A major mechanism to prevent selfing is the self-incompatibility (SI) recognition system, which consists of male and female specificity genes at the S-locus and SI modifier genes. Under conditions that favour selfing, it is predicted that mutations disabling the male recognition component enjoy a relative advantage over those disabling the female component, because male mutations would increase through both pollen and seeds whereas female mutations would increase only through seeds. Despite many studies on the genetic basis of loss of SI in the predominantly selfing plant *Arabidopsis thaliana*, it remains unknown whether selfing arose through mutations in the female specificity gene (S-receptor kinase, SRK), male specificity gene (S-locus cysteine-rich protein, SCR; also known as S-locus protein 11, SP11) or modifier genes, and whether any of them rose to high frequency across large geographic regions. Here, we report that a disruptive 213-base-pair (bp) inversion in the SCR gene (or its derivative haplotypes with deletions encompassing the entire SCR-A and a large portion of SRK-A) is found in 95% of European accessions, which contrasts with the genome-wide pattern of polymorphism in European *A. thaliana*. Importantly, interspecific crossings using *Arabidopsis halleri* as a pollen donor reveal that some *A. thaliana* accessions, including Wei-1, retain the female SI reaction, suggesting that all female components including SRK are still functional. Moreover, when the 213-bp inversion in SCR was inverted and expressed in transgenic Wei-1 plants, the functional SCR restored the SI reaction. The inversion within SCR is the first mutation disrupting SI shown to be nearly fixed in geographically wide samples, and its prevalence is consistent with theoretical predictions regarding the evolutionary advantage of mutations in male components.



PSC MEMBER

Here we present group leaders. Through their creative research and involvement in teaching, group leaders make a substantial contribution to the success of the Zurich–Basel Plant Science Center.

Dr. Franck Vazquez: Group leader



Photo: Michael Arregger

Our research work aims to unravel the regulatory pathways and diversity of plant small RNAs (sRNAs) and to address their biological significance. Regulations by sRNAs, including microRNAs, were only described a decade ago. Although our knowledge of these regulations has grown exponentially in recent years, most of their roles still remain to be decrypted. Our current research effort focuses on a novel sRNA regulatory network which is of primary importance for the physiology and development of plants. The essence of this network relies on secondary small interfering RNAs (siRNAs) that are generated from the 3' end of transcripts of the four TIR/AFB2 auxin receptor (TAAR) genes upon cleavage guided by the microRNA miR393. These siRNAs depict a complex network that trans-regulate and coordinate the expression of the other TAAR members.

Photos: Franck Vazquez



Rosettes (top) and inflorescences (bottom) of Col-0 wild-type plants, of *dcl1-9* mutants which are affected in the biogenesis of canonical microRNAs and of *hen1-5* mutants which are affected in the turn-over of microRNAs and other small RNAs.

Key findings

When I started my PhD studies (end of 2001), none of the plant sRNAs had been sequenced, and the concept of regulation of endogenous genes by sRNAs had just been verified in *Caenorhabditis elegans*. In cooperation with pioneers in the RNA silencing field, we made seminal contributions to understanding the miRNA pathway of plants: we found that HYL1 (HYPONASTIC LEAVES 1) and HEN1 (HUA ENHANCER 1) are both critical actors of miRNA biogenesis and that AGO1 (ARGONAUTE 1) is crucial for miRNA-guided regulation of mRNA targets (Fig.1). Also, we were the first to identify the class of trans-acting siRNAs that mainly function to establish leaf polarity. More recently, I identified the novel class of

long-miRNAs, and we have recently shown, in collaboration with scientists of the University of California, that they guide DNA methylation of their targets and provide an important support for stable epigenetic changes of gene expression.

Current and future work

We have identified some of the characteristics of the TAAR siRNA network important for plant development and auxin response (Fig.2). We want to decrypt the connections of this network, their hierarchical, temporal and spatial functions, and their biological significance. It is also our aim to understand how this network is itself regulated.

Curriculum vitae

Franck Vazquez received his PhD with highest honours from the University of Lille in 2004. From 2005 to 2007 and 2008 to 2009, he was a postdoc at the Friedrich Miescher Institute for Biomedical Research and at the Botanical Institute of Basel. In October 2009, he was awarded an Ambizione grant¹ by the Swiss National Science Foundation to found his group at the Botanical Institute of Basel. He has been lecturer at the University of Basel since 2005. He is married and lives in Altkirch.



Rosettes (top) and inflorescences (bottom) of Col-0 wild-type plants, of *dcl1-9* mutants which are affected in the biogenesis of canonical microRNAs and of *hen1-5* mutants which are affected in the turn-over of microRNAs and other small RNAs.

Dr. Franck Vazquez

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¹ Ambizione is an individual funding instrument of the SNSF to encourage young scientists (max. 5 years postdoc) to lead independent research projects.





1st Plant Sciences and Policy Workshop: Evidence-Based Policy Making

Two lectures introduce the concepts of environmental governance and the problems which environmental policy-work encounters. They show how scientific evidence could be sought and applied to enhance the ability of policy-makers to make better informed decisions. In three case studies, students analyse how scientific evidence is included in the political process in practice. Interviews with different stakeholders will be part of this work. The participants will be guided through the process by external experts. In the closing public roundtable discussion, experts from government, NGOs and science will be present.

Contact: andrea.pfisterer@ipw.biol.ethz.ch

ProDoc Research Modules "Plant Sciences and Policy"

Another five PhD fellowships in "Plant Sciences and Policy" supported by the SNF will start this autumn.

PSC Mercator PhD fellowships

Mercator will fund four specialized PhD fellowships at the interface of plant sciences and policy. The fellowships will combine research work in one of our labs with a six-month internship at a national or international organization. Research topics will relate to climate change, biodiversity loss, food security and sustainable agriculture.

Contact: andrea.pfisterer@ipw.biol.ethz.ch

New international Postdoc Fellowship Program in Plant Sciences

In February of this year, the PSC submitted a proposal to the European Research Executive Agency to receive co-financing to build up an "International Postdoc Fellowship Program in Plant Sciences" called PLANT FELLOWS. The proposal has received a favourable evaluation, and we have entered the negotiation process. PLANT FELLOWS is expected to start in summer 2011.

The Fellowship Program will be open to applicants from all over the world. PLANT FELLOWS will be coordinated by the PSC and will offer an outstanding training program for postdocs, including transnational mobility, industrial placements, career events, workshops and courses dedicated to training in entrepreneurship and complementary skills.

This unique program offers postdocs the opportunity to obtain a Certificate in Plant Research and Development. With this certificate, the PSC aims to offer an internationally recognised qualification that offers the fellows new career opportunities and attractive employment conditions.

Contact: manuela.dahinden@ipw.biol.ethz.ch

PSC-Syngenta Research Fellowship Program: Call for proposals 2010

The PSC launches a new call for proposals under the PSC-Syngenta Research Fellowship Program. Applications consisting of competitive research proposals for PhD (3 years) and Postdoc fellowships (1 to 2 years) must be submitted by November 1st. Proposal forms can be obtained from Manuela Dahinden (PSC coordination office).

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