

NEWSLETTER

2011/20

Editorial



Photo PSC

The Zurich-Basel Plant Science Centre has gone from strength to strength. It has developed key roles in graduate education, in fundraising for plant science research, in networking amongst academ-

ics, and in liaising between academia, industry and the public. Its success can be attributed to careful stewardship and the dedication of its staff. But its life depends on the enthusiastic participation of both, students and mentors. I want to maintain this upward trajectory in my role as PSC president from 2012, so that we can continue to rely on the benefits and opportunities the PSC provides.

Already, we have much to look forward to. The graduate training courses will be complemented by a new post-doctoral training initiative - PLANT FELLOWS - funded by the European Commission. Close interactions with Syngenta will continue through PhD and Post-doctoral fellowships. We will welcome a new ETH Professor for Sustainable Agroecosystem Sciences, supported by a generous donation by Syngenta to the ETH Foundation. We can also look forward to greater national interactions through the Swiss Plant Science Web, of which the PSC is a core component.

This is an important time for plant sciences and plant scientists. There is much that we can offer to society with our knowledgebase on how plants work, on their integration within ecosystems, and on agricultural practices. The PSC Plant Science and Policy PhD program is a step towards ensuring that scientific thinking influences future decision-making on agricultural and environmental matters. This will help guarantee that the future is not only bright but also green.

I look forward to meeting you at the PSC retreat on October 7th.

*Samuel C. Zeeman, ETH Zurich
PSC president, 2012*

<http://www.plantsciences.ch>



Zurich – Basel
Plant Science Center



University of
Zurich^{UZH}



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BASEL

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Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

Upcoming events

Understanding Plant Phenotypes – PSC Symposium, 4 Nov 2011, ETH Zurich, Auditorium maximum

PSC retreat 2011 (by invitation only), 7 Oct 2011, 9-19h, Uto Kulm Zurich

News & Awards

- **Silvia Dorn** was elected Fellow of the International Society of Horticultural Sciences. The society, which has 7000 members in 150 countries, honored her outstanding scientific contributions to high-value crops worldwide.
- **Silvia Dorn** and group members **Hainan Gu** and **Jacqueline Hughes** received the Top-Cited Paper Award of the Royal Entomological Society.
- **Kentaro Shimizu** received the Human Frontier Science Program's Young Investigator Award 2011 as principal investigator of the project "Network merging analysis of duplicate genome function in recently hybridized species".
- The paper "Arsenic tolerance in Arabidopsis is mediated by two ABC-type phytochelatin transporters", published in PNAS by **Song W-Y**, Park J, Mendoza-Cózatl DG, Suter-Grotemeyer M, Shim D, Hörtensteiner S, Geisler M, Weder B, Rea PA, Rentsch D, Schroeder JI, Lee Y & **Enrico Martinoia**, has been awarded the 2010 Cozzarelli prize by the PNAS editorial board for the best paper in the field of Applied Biological, Agricultural, and Environmental Sciences.
- **Jan Elias** received the prestigious Vontobel Prize for his outstanding PhD thesis in basic agricultural sciences (Silvia Dorn group).

Four additional ProDoc Research positions in "Plant Sciences and Policy"

The SNF will support four PhD fellowships in the following three research projects: "Plant competitive interactions under soil nutrient transport limitation" (Pascal Niklaus)

"Adaptation and biodiversity in alpine habitats – integrating genomic and ecological perspectives" (Kentaro Shimizu and Alex Widmer)

"Soil biodiversity and functioning in agricultural ecosystems: Developing science for evidence-based policy" (Marcel van der Heijden and Bernhard Schmid)

Project descriptions and open positions will be published on the PSC website.

Four new PhD students to link plant science with policy

In July, the last of four PSC-Mercator Fellows started her PhD. All four projects are designed in collaboration with a policy organization and are conducted together with that organization, focusing on policy implications of their results. Apart from their usual PhD work, the students will follow the PhD program in Plant Science & Policy and will conduct a six-month internship in the partner policy organization. The PSC-Mercator Fellows are Tobias Bühlmann, John Garcia-Ulloa, Erin Gleeson and Sonja Hassold.

Tobias Bühlmann studied the influence of *Alnus viridis* on nitrogen concentration in the soil solution in the Swiss Alps with Christian Körner's group in Basel, where he is now doing his PhD. He will analyze the changes in biodiversity and in soil nitrogen pools and fluxes



Photo: Bright Ruler, Rob & Rose Zürich

caused by green alder encroachment into former open montane grasslands in Switzerland. In collaboration with the Federal Office for the Environment (FOEN) and the Swiss Biodiversity Forum, he will elaborate land management recommendations for local stakeholders.

John Garcia-Ulloa studied the implications of oil-palm expansion in Colombia. In Jaboury Ghazoul's group he is now exploring the potential environmental and socioeconomic tradeoffs and multiple benefits of REDD+ implementation in relation to agricultural production, forest protection, biodiversity conservation and economic development. Resulting models based on the pilot study countries Colombia, Indonesia and the Democratic Republic of Congo can be calibrated for other regions to understand the implications of REDD+ implementation in other contexts. The partner in this project is the Division of Environmental Policy Implementation of the United Nations Environment Programme (UNEP).



Photo: Bright Ruler, Rob & Rose Zürich

At the University of Berne, **Erin Gleeson** worked with tree rings from Patagonia toward a hydroclimatic reconstruction for the Rio Santa Cruz. In Nina Buchmann's lab she will compile data from a variety of sources on forest growth in Switzerland to arrive at annual tree growth estimates and assessment of forest growth changes and tree species vulnerability to climate and environmental change at different temporal and spatial scales. In collaboration with the FOEN, she will elaborate the Swiss policy demands and options arising from the UN Framework Convention on Climate Change (UNFCCC) and the UNECE Convention on Long-range Transboundary Air Pollution (CLRTAP) for Switzerland.



Photo: Jörg Franke

Sonja Hassold studied biology at ETH Zurich with a particular focus on Ecology and Evolution. In Alex Widmer's group she is seeking to develop and validate a DNA barcoding system to distinguish and identify the rosewood species of Madagascar exploited for rosewood timber. The results will aid the relevant policy-implementing organizations to develop internationally binding regulations for the conservation of rosewood. The partners in this project are the Zurich Zoo, the CITES Secretariat and the Wildlife Conservation Society.



Photo: Bright Ruler, Rob & Rose Zürich



EDUCATION / (PS)₂A

PhD Program in Plant Sciences, Autumn 2011

- Introductory Course to “R”, 21–23 Sep 2011
- Scientific Writing Practice I, 23 Sep & 14 Oct 2011
- Plant Sciences and Policy: Communication Strategies (workshop), 27 Sep & 2 Nov 2011
- Challenges in Plant Sciences (colloquium), 28 Sep & 7 Nov 2011
- PhD seminar & online course: Plant Response to Stress, 28 Sep; 11 Nov; 12 Dec 2011
- Radio-Isotopes in Plant Nutrition, 30 Sep; 7/21/28 Oct; 11/18 Nov; 2/9 Dec 2011
- Genetic Diversity: Techniques, 3 Nov & 24 Nov 2011
- Writing a Post-doctoral Grant, 14–15 Nov 2011
- Computational Biology, 30 Nov & 1 Dec 2011
- Research with biological material from abroad – International regulations and good research practice (CBD ABS, IT FAO, CITES), 7–8 Dec 2011
- Agriculture and Society – Vision 2020, 10/17/24/31 Jan 2012 & 7 Feb 2012

New PSC information services

The PSC listserver regularly informs subscribers about current events organized by the PSC or its member institutes and posts the latest news in plant sciences.

Subscribe at:

http://www.plantsciences.ch/psc_events

Call for student engagement

Every other year, the PhD student association of the Zurich-Basel Plant Science Center (PS)₂A organizes an **international PhD Symposium**. The association is currently looking for students to organize the 2012 symposium. Those who respond to this call will gain new project management experience, meet fellow students, and receive 3 CP for accomplishing this interesting task.

Contact: Matthias Haeni, haenima@ethz.ch

Ecosystem Dynamics in a Changing World

PSC hosted a summer school for the SPSW

Ecosystem dynamics cannot be explained by one research discipline alone, and unwanted global change has to be tackled in a multidisciplinary approach. This was the take-home message drafted by participants of the 2011 PSC-SPSW Summer School during their stay in Mürren. As general feedback to the organizing body, the Zurich-Basel Plant Science Center, the 30 national and international PhD-students further underlined the need of interdisciplinary thinking in their future research: the questions of other disciplines should be kept in mind and the contributions of their own discipline should take account of overall research questions.

Surrounded by the impressive scenery of the Swiss Alps, the PhD-students discussed how our ecosystems will respond to future global change. The discussions were guided by nine academic experts, and the topics included the molecular perspective of understanding molecular target genes in species responding to environmental change (Kentaro Shimizu, University of Zurich) and epigenetics introducing an additional layer for evolutionary responses in ecosystems (Oliver Bossdorf, University of Bern). Further topics were the role of plant physiology in understanding ecosystem functions (Christian Körner, University of Basel), the demands of agriculture (Jürg Fuhrer, Agroscope Reckenholz-Tänikon ART), and the importance and response of biodiversity (Ansgar Kahmen, ETH Zurich, Gian-Reto Walther, BAFU, Bern). Three of the experts illustrated the broad variety of model scenarios and ecosystem management practices (Stefan Brönnimann, University of Bern; Christophe Randin, University of Basel; Sebastiaan Luysaert, CEA, France).

On behalf of the scientific organizing committee, we would like to thank all the speakers and the PhD students for making the summer school a lively and inspiring event.

Melanie Paschke, Franziska Humair, PSC

Summary reports at: <http://www.swissplantscience-web.ch/education/phd-summer-school/2011/>



SCIENCE HIGHLIGHTS

PNAS 108(2):656–661 (2011)

Assembly of nonnative floras along elevational gradients explained by directional ecological filtering

Alexander JM, Kueffer C, Daehler CC, Edwards PJ, Pauchard A, Seipel T, MIREN Consortium

Nonnative species richness typically declines along environmental gradients such as elevation. It is usually assumed that this is because few invaders possess the necessary adaptations to succeed under extreme environmental conditions. Here, we show that nonnative plants reaching high elevations around the world are not highly specialized stress tolerators but species with broad climatic tolerances capable of growing across a wide elevational range. These results contrast with patterns for native species, and they can be explained by the unidirectional expansion of nonnative species from anthropogenic sources at low elevations and the progressive dropping out of species with narrow elevational amplitudes—a process that we call directional ecological filtering. Independent data confirm that climatic generalists have succeeded in colonizing the more extreme environments at higher elevations. These results suggest that invasion resistance is not conferred by extreme conditions at a particular site but determined by pathways of introduction of nonnative species. In the future, increased direct introduction of nonnative species with specialized ecophysiological adaptations to mountain environments could increase the risk of invasion. As well as providing a general explanation for gradients of nonnative species richness and the importance of traits such as phenotypic plasticity for many invasive species, the concept of directional ecological filtering is useful for understanding the initial assembly of some native floras at high elevations and latitudes.

PNAS 108(12):5127–5132 (2011)

Remotely sensed evidence of tropical peatland conversion to oil palm

Koh LP, Miettinen J, Liew SC, Ghazoul J

Rising global demands for food and biofuels are driving forest clearance in the tropics. Oil-palm expansion contributes to biodiversity declines and carbon emissions in Southeast Asia. However, the magnitudes of these impacts have remained largely unquantified until now. We produce a 250-m spatial resolution map of closed canopy oil-palm plantations in the lowlands of Peninsular Malaysia (2 million ha), Borneo (2.4 million ha), and Sumatra (3.9 million ha). We demonstrate that 6% (or approximately 880,000 ha) of tropical peatlands in the region had been converted to oil-palm plantations by the early 2000s. Conversion of peat swamp forests to oil palm led to biodiversity declines of 1% in Borneo (equivalent to four species of forest-welling birds), 3.4% in Sumatra (16 species), and 12.1% in Peninsular Malaysia (46 species). This land-use change also contributed to the loss of approximately 140 million g of above-ground biomass carbon, and annual emissions of approximately 4.6 million Mg of belowground carbon from peat oxidation. Additionally, the loss of peat swamp forests implies the loss of carbon sequestration service through peat accumulation, which amounts to approximately 660,000 Mg of carbon annually. By 2010, 2.3 million ha of peat swamp forests were clear-felled, and currently occur as degraded lands. Reforestation of these clearings could enhance biodiversity by up to approximately 20%, whereas the establishment of oil-palm would exacerbate species losses by up to approximately 12%. To safeguard the region's biodiversity and carbon stocks, conservation and reforestation efforts should target Central Kalimantan, Riau, and West Kalimantan, which retain three-quarters (3.9 million ha) of the remaining peat swamp forests in Southeast Asia.



PSC website

<http://www.plantsciences.ch>

PSC MEMBER



Photo Juanita Choo

Prof. Lian Pin Koh: new PSC member

Global human population is expected to continue to grow over the next four decades. The ensuing demands for water, food and energy are expected to intensify

land-use conflicts, contribute to greenhouse-gas emissions, and exacerbate threats to natural ecosystems and wildlife. It is therefore imperative that we develop ways to balance our growing consumption needs with environmental protection.

In the Professorship of Applied Ecology & Conservation at the Institute of Terrestrial Ecosystems, ETH Zurich, we frame the issues of food security, rural development, carbon emissions and biodiversity loss with fundamentals of ecological and economic theory. By adopting a holistic “systems approach”, we seek to assess the environmental and socioeconomic implications of pursuing alternative land-use and development options that reflect various societal priorities, including food and biofuel production, carbon storage and sequestration, conservation of forests, biodiversity and ecosystem services, and economic development. Additionally, by evaluating the tradeoffs among these partially competing priorities through spatially-explicit scenario analyses, we develop land-use decision-support tools for policy-makers in developing countries to reconcile these objectives – on the basis of the biophysical, socioeconomic, and technical constraints and considerations – within individual societies and landscapes. Our research is cross-scale in that it evaluates the local implications of global priorities and, conversely, the global implications of local development decisions and outcomes. It is transdisciplinary in that it assesses the implications of land-use and development options for a variety of socioeconomic and environmental outcomes within the context of individual societies and landscapes, as well as the feedback influences of these outcomes on land-use decisions.

Our group employs a variety of scientific approaches such as field surveys and experiments, and developing theoretical and computer simulation models. We also leverage on new technological and societal trends to develop and implement innovative approaches to disseminate science and science-based decision-support tools to the general public. These tools include REDDcalculator.com, SpeciesExtinctionCalculator.com and LandUse-Calculator.com.

Curriculum vitae

Lian Pin Koh is a tropical ecologist by training. He received his PhD in 2008 from the Department of Ecology and Evolutionary Biology, Princeton University, where he studied the environmental and policy implications of oil palm development in Southeast Asia. He then spent three years at the ETH Zurich, first as an ETH Fellow and then as an Oberassistent. During that time, his research focused on key scientific and policy issues concerning tropical deforestation and its impacts on carbon emissions, biodiversity and food security. In 2011, Lian Pin was awarded the Swiss National Science Foundation Professorship, and became SNF Assistant Professor of Applied Ecology & Conservation at the ETH Zurich.

Prof. Lian Pin Koh

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Photos Lian Pin Koh

It is undeniable that oil palm development has improved the living conditions of many rural communities, as seen here in a housing project for the staff of a Borneo oil palm plantation. Oil palm expansion poses a social dilemma because on the one hand it provides employment and improves the living conditions of rural communities, but on the other hand it creates immense pressures to clear natural forests to keep up with demands.

The tropical rainforests of Southeast Asia are experiencing widespread deforestation, forest degradation and fragmentation.

PSC SYMPOSIUM 2011



Understanding Plant Phenotypes

4 November 2011, ETH HG, auditorium maximum

http://www.plantsciences.ch/psc_events/Symposia/Symposium_11

8.45–08.50 Opening by Bernhard Schmid, UZH, PSC steering committee member

8.50–10.30 **Session I: Designing New Phenotypes**

Chair: Fred Meins, UniBaS

- Denis Murphy, University of Glamorgan, United Kingdom
From gene to plate – the design of new crop phenotypes in an era of food insecurity and climate change
- Graham Bell, McGill University, Canada
The multifarious outcomes of uniform natural selection
- Christian Fankhauser, University of Lausanne, Switzerland
The PIF bHLH transcription factors modulate changes in plant architecture induced by light quality and temperature
- Kentaro Shimizu, University of Zurich, Switzerland
Sexual reproduction and phenotypic plasticity of Arabidopsis relatives in changing environments

10.30–11.00 Coffee and poster session

11.00–12.30 **Session II: New Approaches in Phenotyping**

Chair: Achim Walter, ETHZ

- Ulrich Schurr, Forschungszentrum Jülich, Germany
Phenotyping science and technology: overcoming the bottleneck through integrated approaches
- Wilhelm Gruißem, Swiss Federal Institute of Technology Zurich
Integrating leaf growth and circadian regulation – a systems approach
- Christian Wirth, University of Leipzig, Germany
Turning noise into signal – strategies for assembling and analysing phenotypic plant information

12.30–14.30 Lunch and poster session

14.30–16.00 **Session III: Phenotypic Distribution in Communities**

Chair: Bernhard Schmid, UZH

- Eric Garnier, Centre National de la Recherche Scientifique, Montpellier, France
Traits in communities, traits of communities: towards a phenotypic concept of plant communities
- Jonathan Levine, Swiss Federal Institute of Technology Zurich, Switzerland
Effects of competition on the phylogenetic and phenotypic structure of communities
- Peter Linder, University of Zurich, Switzerland
Do functional correlations between phenotypes and environment control the spatial distribution of Restionaceae phenotypes in the Cape flora?

16.00–16.15 **Poster awards** and concluding remarks by Ueli Grossniklaus, UZH, PSC president

16.15–17.00 Apéro and poster session

Admission is free of charge. **Online poster registration:** http://www.plantsciences.ch/psc_events/Symposia/Symposium2011. **Deadline:** 10 October 2011.

Conference Committee: Fred Meins (University of Basel), Bernhard Schmid (University of Zurich), Achim Walter (ETH Zurich), Sylvia Martínez (PSC)

Impressum

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