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NOVA PhD course series "Phenotyping Technologies in Plant-environment Interactions - Integrated Analysis of Omics Data" 11-15 June 2018, SLU Alnarp, 5 ECTS

In this four-year NOVA PhD course series the course in 2018 given at SLU Alnarp will emphasis on the usage of controlled climates to simulate different and future climates as well as on how to integrate different omics data generated in plant phenomics experiments. The lecture topics are i) assessing crop physiology aspects in controlled climates vs the field, ii) how controlled climates can be used to simulate different climates, iii) how plants react upon different treatments, iv) and some techniques and tools to integrate different omics data from plant phenotyping experiments.

Pre-assignments:

a) Reading articles for a journal club revolving around plant phenotyping. Articles have been provided latest three weeks before the course start. See circulated instructions.
b) Practice introduction to Cytoscape as a tool to handle and visualize different data types to be completed by Thursday 14 June
c) Introduction of own research by a short 5 minute in-class presentation **based on a poster**. See circulated instructions.

Sunday 10 June: key hand out at Malmö Central Station at Bistro Royal (14:00-18:00, https://goo.gl/maps/ZpiyY77hnVH2, if not notified late arrival); **Bus 133 leaves every even hour at minutes :42 from Malmö C for Campus Alnarp**

Monday 11 June: Introduction and plant growth under controlled conditions

8:30 Breakfast, H-house coffee room

09.00 – 10.30 Introduction and student presentations (Erik Alexandersson; Articum 2)

10.30 – 12.00 Photosynthesis (Carl-Otto Ottosen, Aarhus University)

13.00 – 13.30 Introduction and demonstration of the Biotron and led light chambers (Erik Alexandersson, Articum 2)

13.30 – 15.30 Labs (Biotron and Horticum)

Four practicals divided in six student groups (groups on last page)

1. Studying potato plants under CO2 and drought stress with gas exchange and porometer (Carl-Otto Ottosen; Biotron)
2. Studying potato plants under CO2 and drought stress with NDVI and infrared thermometer (Kristiina Himanen; Biotron)
3. Studying the disease phenotype of *Phytophthora infestans* infected potato plants grown in different CO2 conditions by infection rate and photosynthesis efficiency of photosystem II (Erik Alexandersson; start in Biotron, then Horticum)
4. Plant imaging demonstration (Aakash Chawade)

Note: Drought-stressed and CO_2-treated plants will be prepared in advance.

16.00 – 17.30 Integrated analysis of lab results (Carl-Otto Ottosen/Aakash Chawade/Erik Alexandersson)

18:00 Joint Dinner with the teachers and student presentation (cont.)

Tuesday 12 June: **Introduction to phenomics**

8:30 Breakfast, H-house coffee room

09.00 - 11.00 Plant Phenomics (Kristiina Himanen, U of Helsinki; Articum 2)

11.00 – 15.30 Labs and packed lunch

Three *in silico* workshops divided in three student groups, 1 hour/practical (Articum and Horticum):

1. Analysis of plant shoot images of potato (Aakash Chawade; Articum)
2. High throughput image analysis with FIJI and Rstudio (Kristiina Himanen; Articum)
3. Root image analysis using FIJI (Mirko Pavicic; Articum)

15.30 – 17.00 Summarizing data from labs/discussion

Dinner: Joint dinner in H-House

Wednesday 13 June: **Omics, Annotations and Visualization**

8:30 Breakfast, H-house coffee room

09.00 – 11.00 Journal Club: Student presentations of the pre-assigned literature in three groups in student pairs of two, 20 minutes presentation + 10 minute discussion (Erik Alexandersson, Aakash Chawade, Kristiina Himanen, Morten Lillemo, Hamid Khazaei; Aquarium, H-House and Articum)

11.00 – 12.00 Introduction to omics and annotation (Erik Alexandersson, Dan Jacobson Oak Ridge National Laboratory, USA; Articum 2)

13.00 – 14.00 Integration of –omics (Dan Jacobson; Articum 2)

14:00 – 15.00 Cytoscape Lab (Piet Jones, Oak Ridge National Laboratory; Articum 2)

15.00-17.00 Plant phenomics and European facilities (Fabio Fiorani, Forschungszentrum Jülich; Articum 2)

Dinner: PhD council BBQ

Thursday 14 June: Field Phenomics and phenomics for breeding

8:30 Breakfast, H-house coffee room

09.00 – 11.00 Field phenomics and breeding (Morten Lillemo, NMBU; Articum 2)

11.00 – 12.00 Phenomics in orphan crops (Hamid Khazaei, University of Saskatchewan; Articum 2)

13.00 – 14.00 Shortcomings of phenomics in plant breeding (Hamid Khazaei; Articum 2)

14.00 – 15.00 EnBlightMe – detecting plant diseases in the field and scoring of Phytophthora infections (Erik Alexandersson; Articum 2)

15.00 – 17.00 Student presentations and discussion (Articum 2)

1. Drought
2. Pathogen infection
3. CO2
4. Shoot analysis
5. Root analysis
6. R for phenomics/Cytoscape

19.00 – 22.00 Social event in Malmö at "Far i Hatten" (map: https://goo.gl/maps/NiudECdSvps)

Friday 15 June: Excursion

8:30 Breakfast, H-house coffee room

09.00 – 10.00 Phenomics in forestry research (Johanna Witzell/Michelle Cleary, SLU; Articum 2)

10.00 – 15.00 Taastrup phenomics facilities and lectures by Thomas Roitsch and Eva Rosenqvist (University of Copenhagen)

15:00 Course evaluation and wrap-up

16.00 Course end and departure to Cph Int Airport and Malmö/Alnarp

Post course assignment:

Written report of the lab exercises **deadline 25 June**

Groups

Group 1: Miia Mänttäri, Eva Ortvald Erichsen, Muhammad Awais Zahid, Percy Innocent Mnisi

Group 2: Guangxun Fan, Most Champa Begum, Karina Ustariz

Group 3: Javier Andrés Jiménez, Jolayemi Lekan, Thayna Mendanha, Ansori Maré

Group 4: Kati Knuutila, Espen Sannes Sørensen, Frans Boogaard

Group 5: Daniel Wasonga, Amos Premkumar, Hui Liu

Group 6: Catja Selga, Alye Tefera, Jing Li, Mary Makapela