

Frontiers in Plant Phenomics Workshop

North Carolina State University, 1-3 June 2015

Final Project Report

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North Carolina State University hosted the Frontiers in Plant Phenomics Workshop on 1st-3rd June 2015. It brought together scientists from North Carolina State University, the University of Adelaide, Shanghai Jiao Tong University and the University of Nottingham, as well as selected specialists from collaborating agencies and businesses. This workshop offered a special opportunity to examine the current state of plant phenomics research and to conceptually shape the future of this interdisciplinary field that combines plant biology, various measurement technologies and advanced computational methods.

Over three days, the participants considered the current state of plant phenomics by visiting facilities, exchanging ideas about current research activities, and discussing current challenges. On the first day, participants visited facilities in the Research Triangle Park at the North Carolina Biotechnology Center, Monsanto's automated greenhouse and phenotyping facility, and the greenhouse for research and development at Bayer Crop Science. They also visited the N. C. State Phytotron on the second day. These visits set the scene by highlighting the current capabilities of plant phenotyping and plant growth facilities, and the scientific and commercial applications of phenotyping. On the second day, participants presented overviews of their research and highlighted the future directions that are needed to advance plant phenotyping from the microscope scale of the cell to the macroscopic scale of the whole plant and the broad scale of the field. This was followed by small and whole group discussions of the frontiers of plant phenomics that concluded at the end of the third day.

The workshop had four important outcomes.

1. Participants agreed to write a joint paper on plant phenomics that focuses on standards and an integrated plant phenomics framework. This should be a useful and highly cited paper as it integrates perspectives from a wide range of disciplines. It should provide practical and technical guidance for specialists whose research involves plant phenomics.
2. Participants also agreed to develop a joint research project. It will quantify the phenome of a model plant species under the influence of various biotic and abiotic factors, and ultimately show how this standardised approach can be used

to determine key factors that influence plant yield. State-of-the art standards in plant phenotyping measurements will be used in combination with advanced image analysis tools and artificial intelligence to study the phenome of a model crop species.

3. Eleven collaborations in plant biology, instrumentation and analytics were proposed among participants.
4. Personal relationships were established that will further strengthen partnerships among the four universities.

Details of the workshop can be found in the supporting appendices, which include:

- A. Short article for the AC21 Newsletter
- B. Expenditure of the AC21 grant funds.
- C. The conference program book, which includes a list of participants



Workshop participants

- 1st row: Mike Keller, Stephan Haefele, Marcele Rojas-Pierce, Dabing Zhang, Rachel Burton, Carole Saravitz
2nd row: Becky Boston, Gina Brown-Guedira, Zoe Wilson, Trevor Garnett, Colleen Doherty, Jeff White
3rd row: Tony Pridmore, Zheng Yuan, Greg Buol, Tommy Carter, Anton van den Hengel, Darren Wells
4th row: Vasu Kurapathy, Jose Cisneros, Bettina Berger

Short article for the AC21 Newsletter

Title: AC21 Special Project Fund: Frontiers in Plant Phenomics Workshop

North Carolina State University hosted the Frontiers in Plant Phenomics Workshop on 1st-3rd June 2015. It brought together scientists from North Carolina State University, the University of Adelaide, Shanghai Jiao Tong University and the University of Nottingham, as well as selected specialists from collaborating agencies and businesses. This workshop was made possible by a grant from the AC21 Special Project Fund. It offered a special opportunity to examine the current state of plant phenomics research and to conceptually shape the future of this inter-disciplinary field that combines plant biology, various measurement technologies and advanced computational methods.

Over three days, the participants considered the current state of plant phenomics by visiting facilities, exchanging ideas about current research activities, and discussing current challenges. On the first day, participants visited facilities in the Research Triangle Park at the North Carolina Biotechnology Center, Monsanto's automated greenhouse and phenotyping facility, and the greenhouse for research and development at Bayer Crop Science. They also visited the N. C. State Phytotron on the second day. These visits set the scene by highlighting the current capabilities of plant phenotyping and plant growth facilities, and the scientific and commercial applications of phenotyping. On the second day, participants presented overviews of their research and highlighted the future directions that are needed to advance plant phenotyping from the microscope scale of the cell to the macroscopic scale of the whole plant and the broad scale of the field. This was followed by small and whole group discussions of the frontiers of plant phenomics that concluded at the end of the third day.

The workshop had several important outcomes. Participants agreed to write a joint paper on plant phenomics that focuses on standards and an integrated plant phenomics framework. Participants also agreed to develop a joint research project. It will quantify the phenome of a model plant species under the influence of various biotic and abiotic factors, and ultimately show how this standardised approach can be used to determine key factors that influence plant yield. Finally, research collaborations among the participants were initiated in plant biology, instrumentation and analytics.

Interim financial report

The following page is an interim financial report dated 4th December 2105. As final reconciliation of this grant will be done when accounts are finalised at the end of the month, it is impossible to provide a complete financial report at this time. A final financial report will be sent to AC 21 in January 2016.

**Final Financial Statement
for the Period 1 March 2015 to 4 December 2015**



Project Title: Frontiers in plant phenomics
Sponsor: Academic Consortium 21
Chief Investigator: Prof Michael Keller
Our Reference: 141 62114998 **RMO File No:** 2015/1154
Commencement: 01-Mar-15 **Completion:** 31-Dec-15
Funding Awarded: USD \$10,000

INCOME (EXCL. GST)

Research Income received	\$ 12,873.33
<i>Total Income for the Reporting Period</i>	<u>\$ 12,873.33</u>

EXPENDITURE

Salary	\$ -
Operating	\$ 5,254.86
Travel	\$ -
<i>Total Expenditure for the Reporting Period</i>	<u>\$ 5,254.86</u>

Balance as at 4 December 2015	<u>\$ 7,618.47</u>
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I hereby certify that the above statement is an accurate reflection of project income and expenditure for the reporting period and that all funds have been spent in accordance with the project agreement.

Prof Michael Keller
Chief Investigator

24/12/15
Date

Chelsea Katsikitis
Manager, Research Accounting

Date