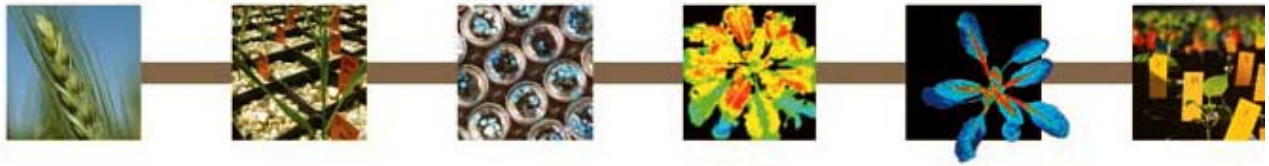
National Plant Phenomics Facility

PHENOMICS TECHNOLOGY CENTRE



The Digital Phytotron
The National Plant Phenomics Facility
Canberra / Adelaide, Australia

THE UNIVERSITY OF ADELAIDE AUSTRALIA

ACPFG AUSTRALIAN CENTRE FOR PLANT FUNCTIONAL GENOMICS PTY LTD

CSIRO

Australian Government Department of Education, Science and Training

Government of South Australia

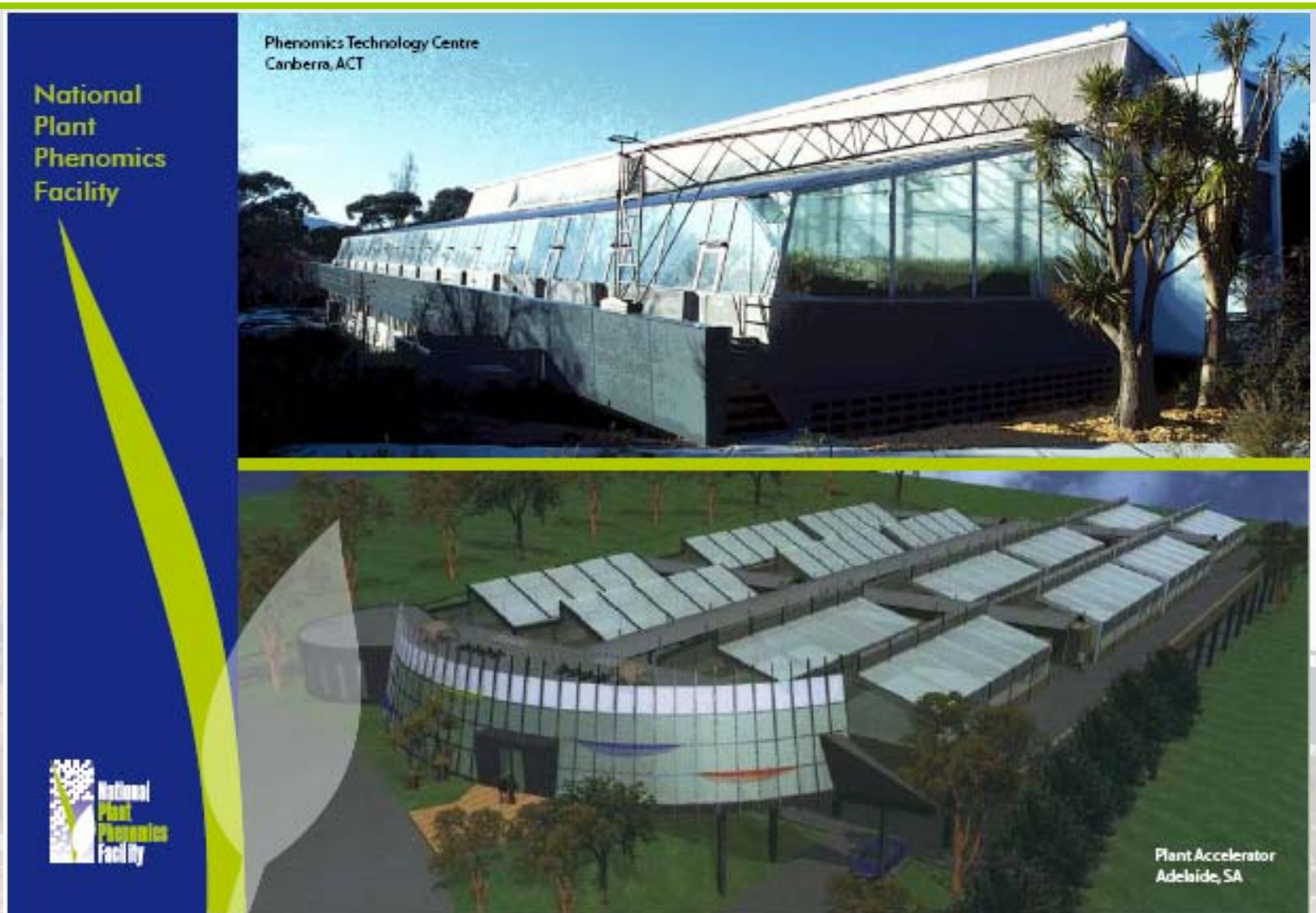
ANU THE AUSTRALIAN NATIONAL UNIVERSITY

plant energy biology ARC Centre of Excellence

National Plant Phenomics Facility

PHENOMICS TECHNOLOGY CENTRE

National Plant Phenomics Facility
Canberra and Adelaide



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Background to the National Plant Phenomics Facility

- $500M over 5 years
- Across all Australian Scientific Disciplines
- Conceived 2 years ago
- Scoping study of “need” called a “Roadmap” produced early 2006
- Plant Phenomics identified as a national priority in plant sciences area
- Joint UA, CSIRO, ANU proposal “National Plant Phenomics Initiative” successful and currently contracting (Total value approx $50M)

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National Plant Phenomics Facility

High Resolution Plant Phenomics Centre
Canberra, ACT

National Plant Phenomics Facility

HRPPC

What is the High Resolution Plant Phenomics Centre?

The Canberra node will focus on the development, testing and application of the next generation of research tools to probe plant function and performance.

These tools will enable for a comprehensive, continuous record and analysis of key physiological parameters throughout the plant lifecycle, under controlled growth conditions and in the field.

Total budget approx $18M over 5 years

$4.2 New Equipment

Approx $4M support salaries

Approx $6M in Phytotron Refurb and growth facilities

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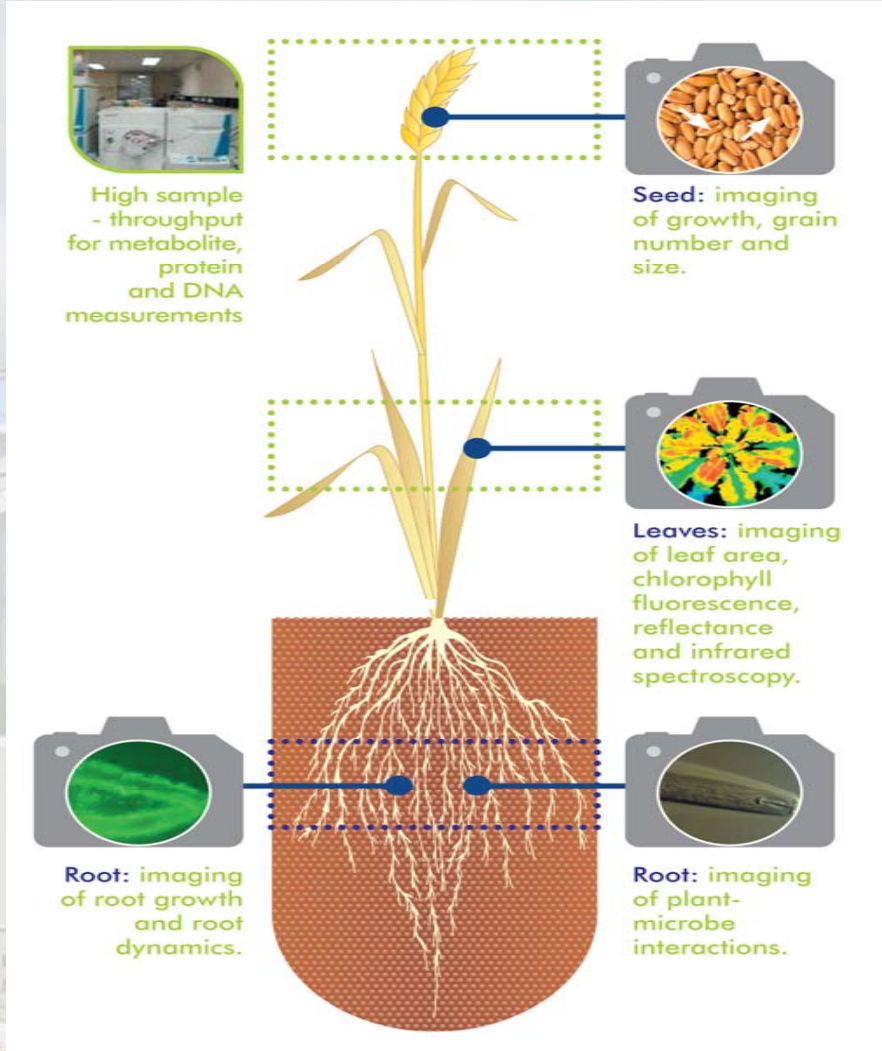
Overview of Evolving Phenomic Capabilities

Non-destructive and destructive measurements are made on parts of the plant that are above and below ground throughout the plant's lifecycle.



A significant part of the proposal involves the development of a new generation of technologies to monitor plant characteristics and performance.

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An Example of Phenomic Technology Application.
Looking within the Plant: Hyperspectral Imaging

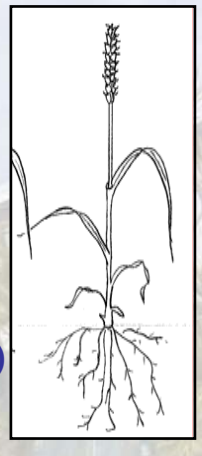
Existing Approach

"STATIC"

"Grind and Find"
Wet chemistry

(Months)

- **Crop N**
- **Crop / stem CHO**
- **Biomass**



Phenomic Approach

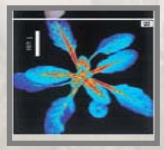
"DYNAMIC"

Non-destructive
Imaging of diagnostic
Spectral bands

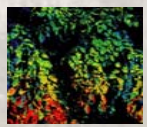
(Days)

- **Crop N**
- **Crop / stem CHO**
- **Biomass**
- **Stress Index**
- **Water content**

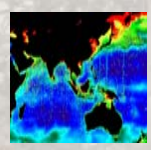
SCALABLE



Plant



Canopy



Biosphere

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Novel Phenomic Technologies Innovative Applications

Digital monitoring of shoot and root growth

→ *Scanalyser*

→ *Growth Imaging*

Dynamic germplasm enhancement for vigour and morphology in cereals and dicot crops:
- **early vigour**
- **tillering**
- **root growth**
- **shoot growth**

Spectral imaging of shoots

→ *Chlor Fluor*

→ *Hyperspectral / IR*

Glasshouse to field:
crops and ecosystem monitoring
- **C and N-content**
- **Stress tolerance**
- **Field growth / biomass**
- **Senescence profile**
- **Weed ingress / biodiversity**

***Microimaging**

→ *SEM / X-Ray Microprobe*

→ *FTIR / Metabolite imaging*

Cellular and sub-cellular spatial location of plant components for "ground truthing" intact plant signals

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Plant Phenomics – from Laboratory to the Field

Field validation.

Application of technologies in the field.

HRPPC development of digital imaging techniques and analysis systems for plant growth and performance.

Integrated controlled environment and plant analysis facilities.

“Digital” Phytotron based in Canberra.

Building upon existing infrastructure to enable new generation of technologies and innovation.

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- HRPPC - Building New Capabilities

The HRPPC will build upon existing infrastructure within the Canberra Phytotron. Glasshouse, plant growth cabinets and laboratory space will be adapted to accommodate this new initiative.