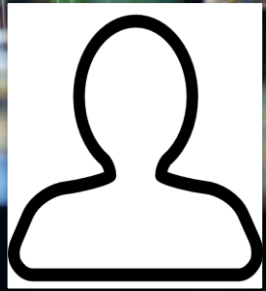
Plant Productivity Group

Prof. T. Lawson

Prof C. Raines

Prof P. Mullineaux

Dr U. Bechtold



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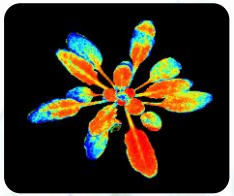
Research focus



- **Increase plant performance: Sustainable resources for food and fuel**
- Manipulating/optimizing plant processes
- Improved plant fitness in a changing environment – sensing the environment, gene discovery and manipulation
- Development of bespoke equipment and techniques


- Manipulating carbon metabolism to improve photosynthesis and yield
- Improved water use efficiency: stomatal behaviour
- Phenotypic exploration of natural variations in Photosynthetic capacity for breeding high biomass.

Photosynthesis and Physiology

Acclimation and Environment


Plant Productivity

Stress and signaling


- Signaling pathways that control defense gene expression
- Transcriptional networks of drought stress responses
- Genetic mapping for gene discovery and evaluation
- Novel genes that can be exploited for biotechnological applications

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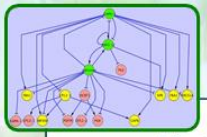
Essex Plant Innovation Centre EPIC

Techniques & Technologies

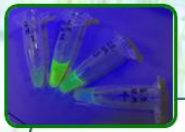
Plant Productivity

Genome-wide methods



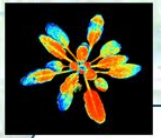
Network modelling,
Trait discovery

Genetic manipulation



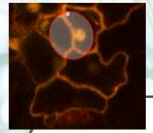
Synthetic biology,
Golden gate
Multigene constructs

Monitoring crop performance



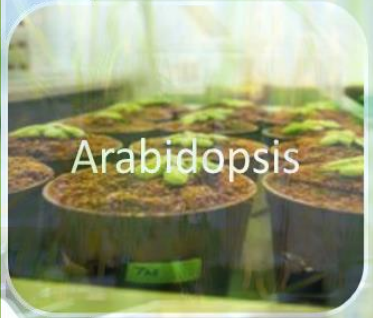
WUE Imaging,
Plant Physiology,
Fluorescence microscopy,
Gas exchange,
Bio-imaging

Technologies and Tools



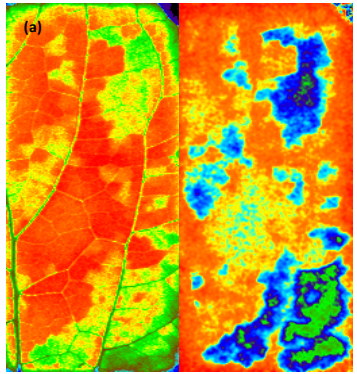
Biosensors,
Chl fluorescence,
Plant gas exchange,
Dual-imaging,
Phenotyping-platform
LED lighting

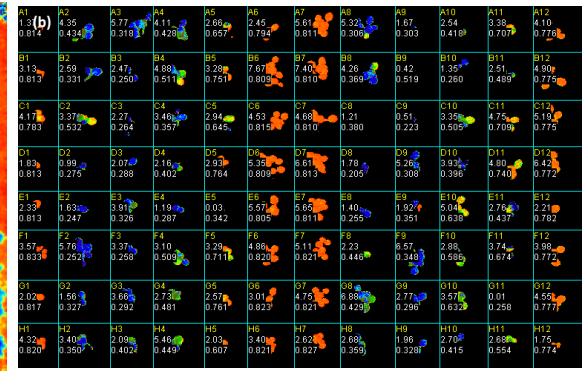
Model & Crop species

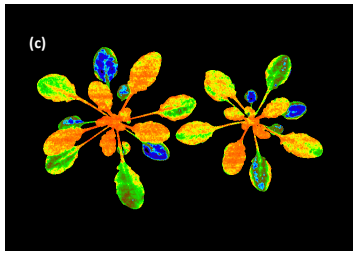


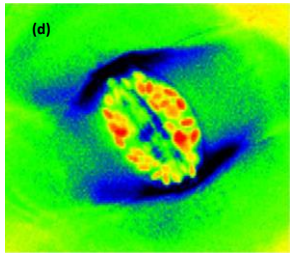
Plant Phenotyping

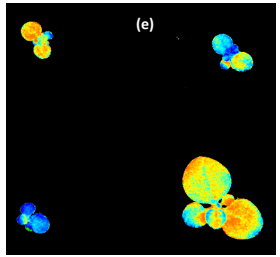
Chlorophyll fluorescence
Thermography
Infra-red gas exchange analysis
Bespoke tools and techniques

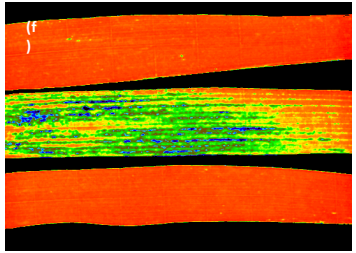


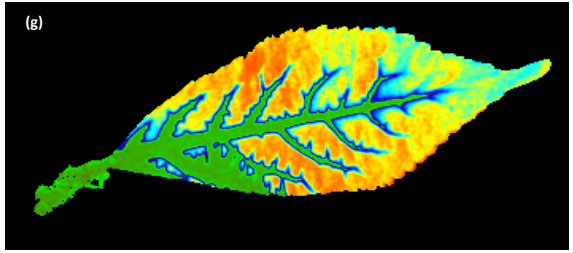


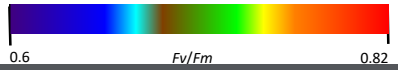


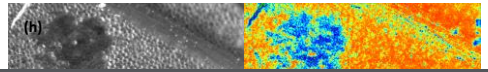








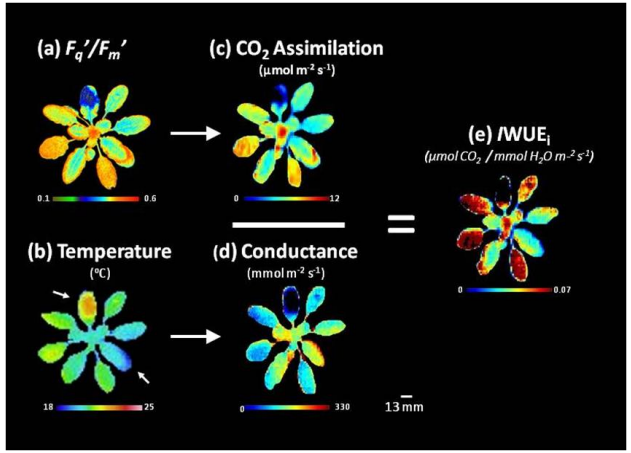


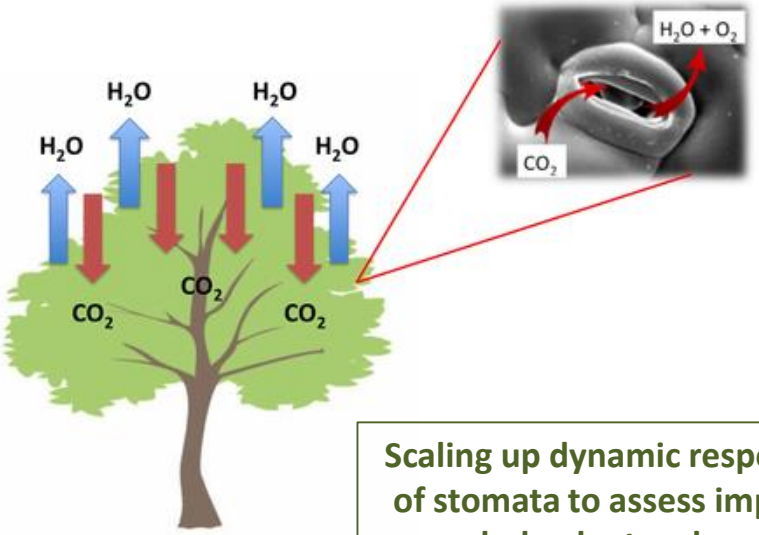


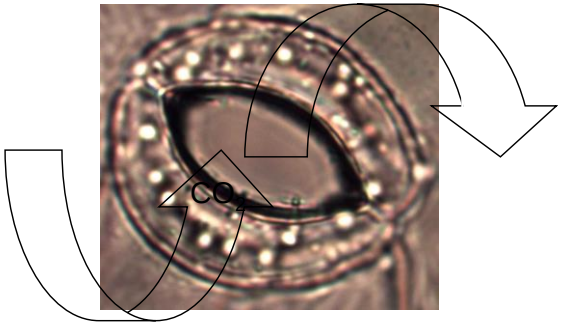
Disease resistance and nutrient deficit

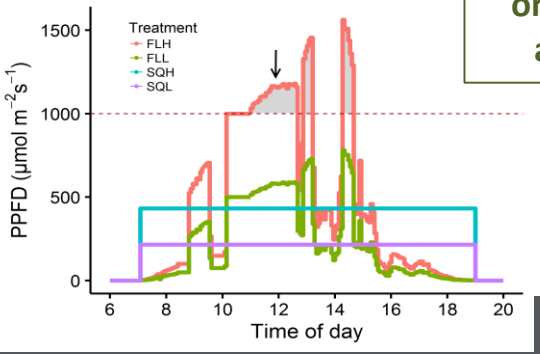
Control | Visible disease | Non-visible disease | Control | Visible disease | Non-visible disease | Control | Visible disease | Non-visible disease

Stomatal Physiology, Phenotyping and photosynthesis





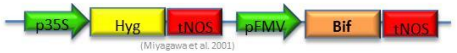




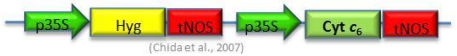
Scaling up dynamic responses of stomata to assess impacts on whole plant carbon gain and water use efficiency

Re-engineering of carbon metabolism

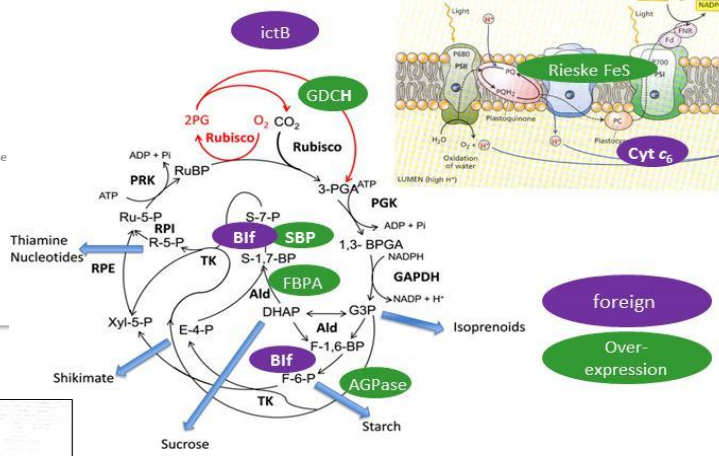
Golden Gate technology

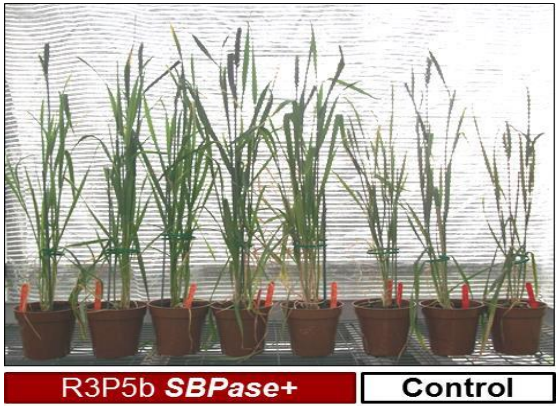


Bifunctional FBPaseSBPase enzyme



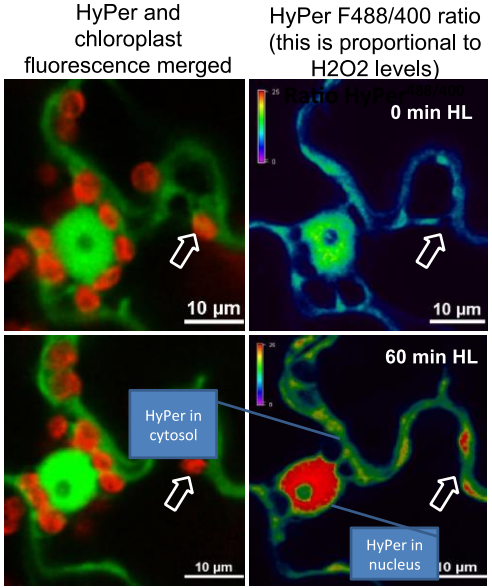
Cyt c_6 protein

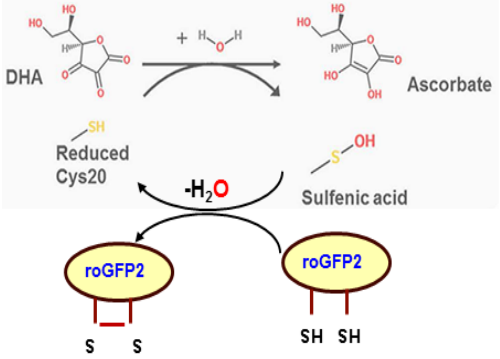




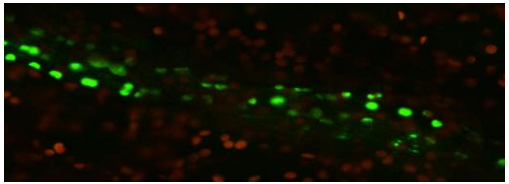
Produce transgenic plants with improved photosynthesis and growth

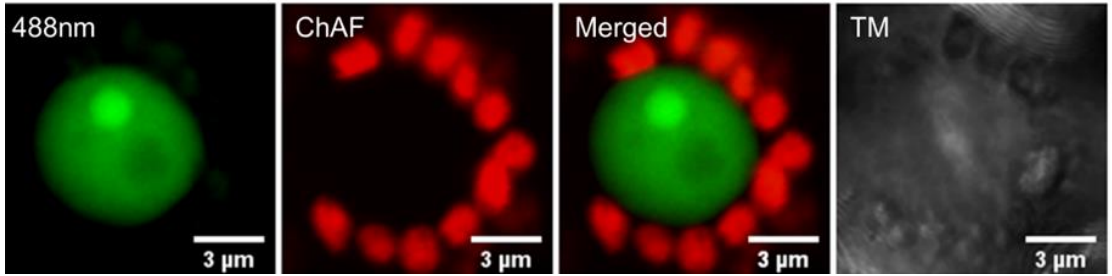
Visualizing plant responses at the cellular level





Tissue specific expression





"Chloroplasts (red) communicate information by signalling to nuclei (green) during acclimation to fluctuating light"

Enhancing resilience to changing environmental conditions

Data analysis

Comparison between distantly related species

Select genes

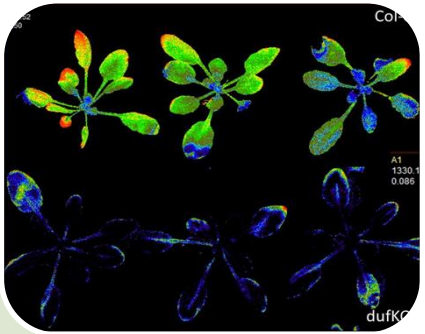
Network inference in a single individual

Comparison between individuals of a single species

Gene selection to enhance resilience to stress

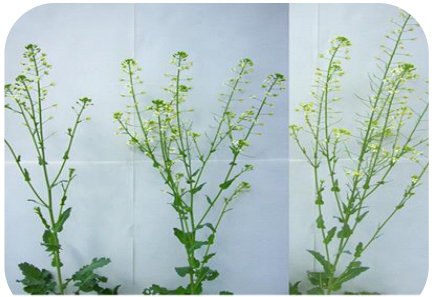
Produce transgenic plants with improved growth under stress

light



drought

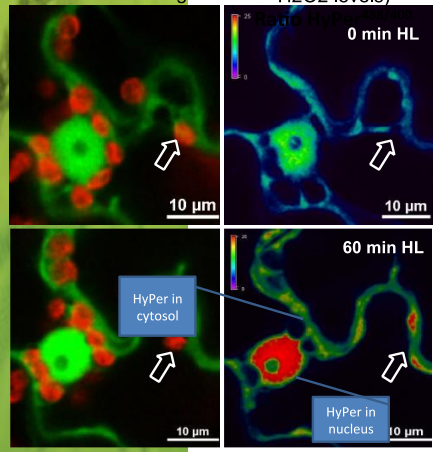
Heat (40°C)

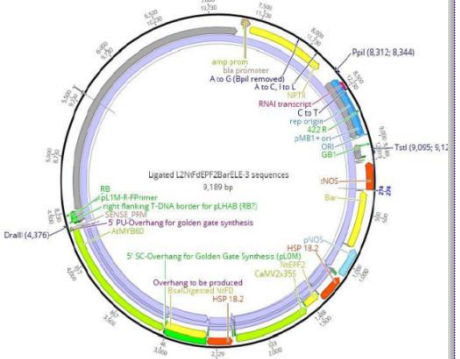


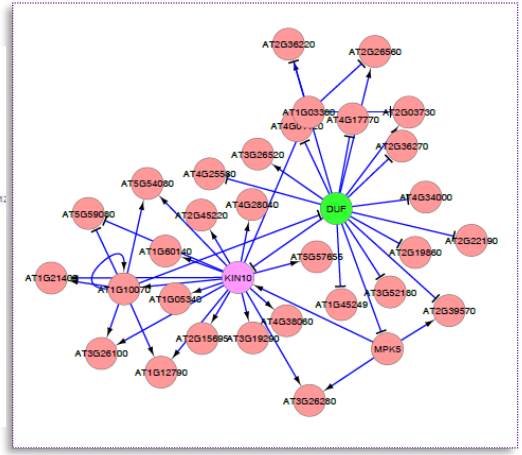
USPs: Technology development and expertise, equipment

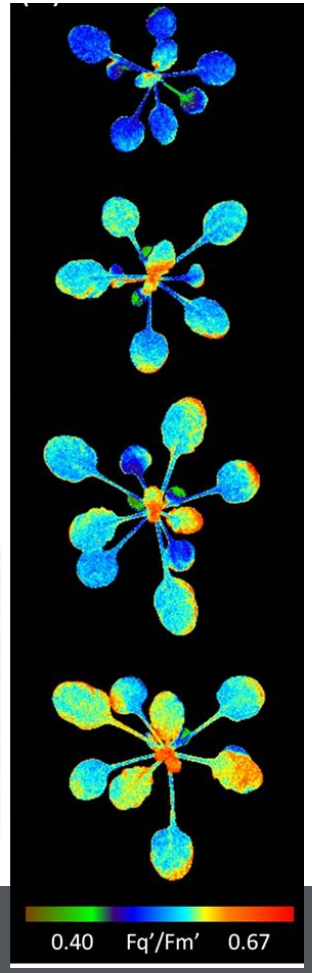
HyPer and chloroplast fluorescence merged

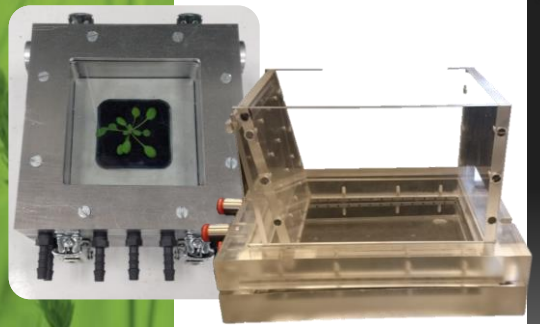
HyPer F488/400 ratio (this is proportional to H2O2 levels)

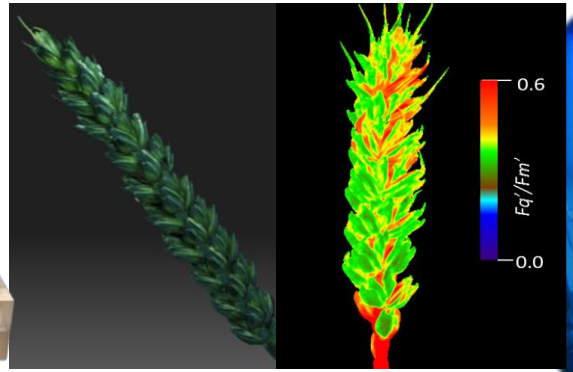






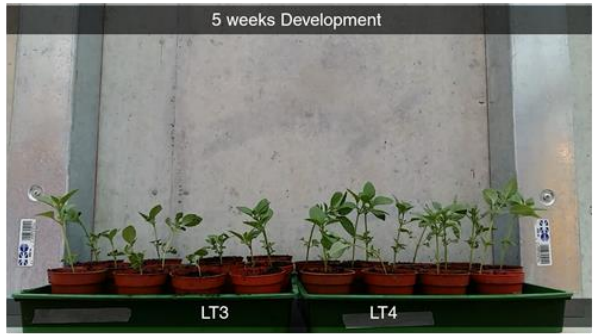


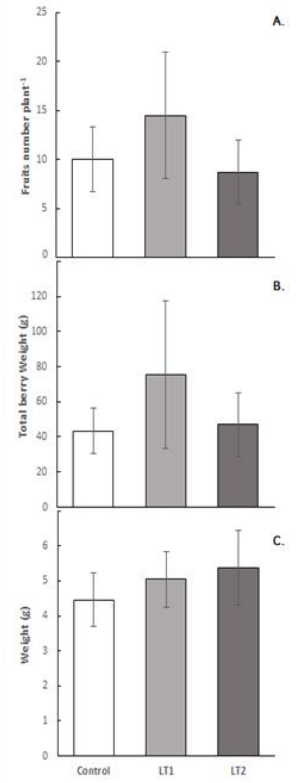




Innovate UK funding with Ellume and Cultinova Ltd.

Intelligent LED lighting for maximised crop yield and reduced energy use





Essex Plant Innovation Centre

The Essex Plant Innovation Centre (EPIC) brings together world-leading scientists from across our **Faculty of Science and Health** with pioneering data scientists from the **Institute for Analytics and Data Science (IADS)** and experts from **Essex Business School** to address global challenges and business problems in agriculture and horticulture.

Funding

BBSRC bioscience for the future

IPA industrial partnership awards

BAYER

Forest Research

NIAB

Perry FOUNDATION

ADC BioScientific Ltd.

Callen-Lenz

BILL & MELINDA GATES foundation

RIPE

IWYP International Wheat Yield Partnership

Research to Deliver Wheat for the Future

NERC SCIENCE OF THE ENVIRONMENT