How can we engineer more robust plants? Smart genetic screens and advanced imaging strategies to understand the cellular basis of plant growth under normal and stress conditions

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Project description:

World food production needs to be doubled by 2050 to meet demands of population growth and dietary changes. This needs to be achieved in the face of climate change, reducing fresh water availability and agricultural land losses, requiring a significant increase in agricultural yields. Abiotic stresses such as drought, temperature and salinity (which is particularly a problem in irrigated areas) are believed to account for losses totally 50% of total yield.

Abiotic stress causes plants to stop growing and our analysis suggests that this is due to the cessation of cell division in meristems, the growing tips of plant shoots and roots. We can follow this using visual reporters of the cell cycle already developed in the lab. However the molecular mechanisms that link stress to the stopping of cell division are unknown. This project aims to study and understand these links and attempt to identify mutants that can uncouple these processes. Plants that continue cell division under stress would therefore be expected to continue growing, resulting in improved yields under stress conditions.

The project will have four main phases: (1) Characterise the effect and impact on stress on the cell cycle, using two different stresses; (2) Build these aspects into a model of the cell cycle; (3) Develop a screen for mutants using the existing reporter lines in the lab, and use this to find mutants which will then be identified using next generation sequencing.

The project will take place in an active research lab with a team of other postdoctoral researchers, technicians and PhD students. The project also involves the opportunity to contribute to existing interdisciplinary collaboration with external groups on salt stress and on modelling of the cell cycle.