

Using synthetic genetic circuits to tightly control root architecture.

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Project Goals:

Establish a functionally characterized parts list of gene regulatory parts to construct orthogonal circuits in plants.

Build a new robotics system for the reliable automated imaging of root systems in plants

Previous work has demonstrated that the development of crown roots increases the flux of water through the plant, while the density of stomata and their aperture determine the rate water evaporates from the leaf surface. By modulating the growth of crown roots and stomatal patterning, we will change the rate at which water is taken up and lost to the atmosphere by the plant. This work will test the hypothesis that plants tend to exhibit responses that are more conservative than necessary due to their origins as wild species. Fine-scale control of developmental pathways affecting root and shoot development will take advantage of synthetic biology approaches that enable reconstruction of regulatory circuits in plants with specific design specifications.

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