

SPEAKER:

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TITLE:

**THE HORMOMETER: a synthetic biology toolbox to study hormone interactions in plants**

ABSTRACT:

The interaction between endogenous plant growth regulators is a key process in the integration of environmental and developmental signals. How different plant hormonal pathways talk with one another is, however, poorly understood, and new phenotyping tools that enable simultaneous detection of the activity of multiple pathways are urgently needed. Taking advantage of the GoldenBraid gene multiassembly technology, we are building the hormometer, a multi-hormone sensor that permits detection of the transcriptional output of several growth regulators at once. An ideal hormometer should consist of a single construct comprised of multiple hormone-specific transcriptional reporters for all nine major non-peptide plant hormones arranged in tandem. Each individual reporter would contain five DNA elements (phytoBricks): a hormone-specific distal promoter, a synthetic core promoter (+5'UTR), a subcellular localization tag, a fluorescent protein coding sequence, and a synthetic terminator (+3'UTR). A combination of three fluorophores and three subcellular localization tags provides enough multiplexing power to monitor the nine growth regulators simultaneously. Towards this objective, a collection of nearly 120 phytoBricks has been generated in our lab, a majority of these parts have been assembled in tester transcriptional units, and to date about a third have been functionally validated in transient assays in tobacco. Using some of the parts from our collection, we have also built two different versions of the ACE hormometer that harbor fluorophore- and localization-tag-compatible reporters for auxin, ethylene and cytokinin, along with a selectable marker, in a single binary vector construct. The upcoming characterization of ACE activity in the resulting Arabidopsis and tomato stable transgenic lines will provide the first proof of concept for our multiplexing approach and offer a new streamlined tool for monitoring the three hormones in parallel.