

## Root phenomics: cheap, fast ... and good?

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Despite the clear importance of roots to crop productivity under mounting agricultural and climatic constraints, our mechanistic understanding of their biology is fuzzy. Engineering plants that efficiently match their environment will require a fundamental understanding of which root shapes confer which functions, how these relationships are conditioned by interactions with the rhizosphere, and what genes control these processes. But these questions are enormous and complex - to answer them we need better and faster ways to see and measure roots! Despite a current renaissance in root phenotyping enabled by digital imaging and computational analysis, there is not one method that could be considered as comprehensive. I will discuss integrated approaches the lab is taking to identify the genetic basis of root growth and environmental response in crops. These span the lab to the field and, importantly, leverage advancements in imaging tools and expertise from the fields of physics, engineering, medicine, and ag-industry.