**Wednesday, September 26, 2018**
**4:45-5:45 p.m.**

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## Engineering plant signal transduction for water smart crops

Plant hormones are a structurally diverse collection of small molecules that control plant growth, development, and environmental responses. Work over the past two decades has established that many plant hormones directly stabilize protein-protein complexes and act analogously to chemical dimerization agents, which were first described for the immunosuppressants rapamycin, FK506, and cyclosporin. Abscisic acid (ABA) stabilizes a complex between soluble ABA receptors and downstream phosphatases; the ABA-induced complex inhibits phosphatase activity, which in turn derepresses downstream kinases and activates signaling. I will describe my lab's work on this sensing module, our efforts to design synthetic ABA receptor agonists, and our development of engineered signaling modules. Specifically, I will describe a new non-sulfonamide agonist called opabactin (for overpowered ABA receptor activation) that possesses ~10x increased potency relative to ABA.
This molecule was developed using a combination of computational screening and structure-guided optimization. Opabactin possesses substantially improved bioactivity relative to quinabactin in both wheat, tomato, and Arabidopsis and confirms the importance of subfamily III ABA receptors as key target sites for manipulating crop water use. I will additionally describe a new PYR1/PP2C-derived chemical-induced dimerization module that is insulated from endogenous signaling components due to surface mutations that establish an orthogonal PYR1-PP2C interaction as well as other mutations that eliminate PP2C catalytic activity and enable control by the agrochemical mandipropamid. This engineered dimerization module provides a simple platform technology for programming crops with agrochemical-controlled traits.