Thursday, September 27, 2018
4:45-5:15 p.m.

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Re-designing CO_2 fixation and allocation in crop plants

Photosynthetic CO_2 fixation is the basis for almost all biomass on Earth. Assimilation of CO_2 by plants is limited by several factors. One major limitation is the relatively low activity and specificity of the major CO_2-fixing enzyme Ribulose-1,5 Bisphosphate Carboxylase/Oxygenase (RuBisCO). Attempts to engineer RuBisCO to increase its activity or specificity have shown some success. Alternatively, synthetic pathways that enable RuBisCO-independent CO_2 fixation have been proposed. We have engineered a synthetic CO_2-fixation pathway that consists of 5 bacterial enzymes and is based on a condensed version of the reverse TriCarboxylic Acid (TCA) cycle found in some autotroph bacteria. This SynCycle can fix CO_2 in vitro and produce glyoxylate. We have engineered *Camelina sativa* to express codon-optimized bacterial Syncycle genes of the SynCycle and import the enzymes them into chloroplasts. Molecular and phenotypic analyses show an increase in biomass and CO_2 fixation rates in the SynCycle expressing camelina plants. (This work is funded by DOE - ARPAe and BER).