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Dissertation Defense
9:00 a.m.–10:00 a.m., Tuesday, July 19, Roberts 321

"Stoichiometric modeling of storage compound metabolism in methanotrophs and green algae"

Methanotrophs and green algae are microorganisms that grow on single carbon substrates. Methanotrophs are bacteria that use methane as their carbon source, and green algae are eukaryotic phototrophs that grow on CO_2. They are of interest both as primary producers in the environment and as biological catalysts for the conversion of greenhouse gases into value-added compounds. Understanding how methanotrophs and green algae adapt to cultivation stresses is key to understanding carbon cycling in the environment and in industrial settings.

This work uses stoichiometric metabolic modeling to investigate the role of carbon storage compounds in the metabolism of C1-utilizing organisms. Storage compounds are accumulated as intracellular reserves of polysaccharides or lipids, which can be catabolized under stress conditions to provide carbon and energy to the cell. Catabolism of carbon storage compounds often results in the excretion of multi-carbon organic compounds that can be utilized as carbon substrates by other members of the microbial community. *In silico* metabolic models were developed for methanotroph and algal systems and used to examine the breakdown of storage compounds in response to common cultivation stresses. For the aerobic methanotrophs, predictions focused on the use of polyhydroxybutyrate in adaptation to O_2 limitation. For the green algae, starch and triacylglycerol reserves are analyzed as sources for compatible solutes, which are produced by cells in response to high salinity conditions. Metabolic modeling of storage compound utilization by methanotrophs and algae helps elucidate the role of these organisms as primary producers and presents an opportunity for industrial production of multi-carbon compounds from single carbon substrates.