Microbial metabolism of methane formation and oxidation
(Dr. Divya Prakash**)**

Methane, in addition to being a potent greenhouse gas, is also a cheap and renewable fuel capable of producing value-added chemicals.Acetate-utilizing methane-producing anaerobes (acetotrophic methanogens) account for two-thirds of the methane produced in anaerobic microbial food chains converting complex renewable biomass to methane (biomethanation). Although much is known regarding one-carbon transformations leading from the methyl group of acetate to methane, there is a rudimentary understanding of electron transport processes coupled to energy conservation and oxidative stress. The mechanism of energy conservation and oxidative stress in acetotrophic methanogens needs to be studied to gain a deeper understanding of acetate metabolism and harnessing energy from methane. Our aim is to advance understanding of the role and mechanism of only two known [4Fe-4S] constituting disulfide reductases: heterodisulfide reductases (HDR) and ferredoxin disulfide reductases (FDR), which are important for energy conservation and oxidative stress in methanogens, respectively. The research questions will be addressed by using a broad spectrum of research methods, including molecular biology, genetics, protein expression and purification, spectroscopy, electrochemistry, transient state kinetics, and structural biology. Overall, the understanding of energy conservation and stress response in methanogens will lead to better methods for modulating biological methane production.