UNDERSTANDING THE ROLE OF MICROBIAL OXIDATIVE EXTRACELLULAR ELECTRON TRANSFER IN BIOGEOCHEMICAL CYCLES. A. Bose[1]. Washington University in St. Louis, Campus Box 1137, One Brookings Drive, St. Louis, Missouri 63130-4899 *E-mail:* abose@wustl.edu

Microbes drive global biogeochemical cycles. Pervasive in every environment, microbially mediated reduction-oxidation reactions dominate matter and energy flow throughout the biosphere. Most microbes use soluble electron donors and acceptors, but some can also use solid phase conductive substances (SPCS). This process is called extracellular electron transfer or EET. EET refers to both the use of SPCSs as electron acceptors (reductive EET or r-EET) and donors (oxidative EET or o-EET). r-EET was noted nearly three decades ago and numerous studies have revealed that it significantly contributes to the biogeochemical cycling of iron, manganese, other heavy metals, sulfur, nitrogen and carbon. The mechanisms underlying r-EET are well known, and this knowledge has influenced what we understand about microbe-mineral interactions and electron transfer processes in nature. In contrast, o-EET (or microbial electron uptake) has come to fore only recently and this newly discovered microbial capability is the focus of my laboratory's research. Oxidative EET fundamentally changes our perception of the ecological role of microbes in biogeochemical cycles because it suggests that abundant elements (such as iron) can serve as sources of electrons for microbial productivity. This is a new frontier of environmental microbiology. We have used both a model organism and new environmental isolates to shed light on the mechanistic underpinnings of this process, and its prevalence in nature. Our results suggest that phototrophic o-EET is rampant in nature and that the mechanisms are not conserved but share common traits. Future work aims to characterize these proteins biochemically and structurally. We also aim to expand our search of o-EET capable microbes to non-phototrophs. Our results suggest that o-EET is very prevalent in nature and affects many geocycles and this metabolism needs to be explored further to improve our understanding of such electron transfer processes in nature.