

Electrical wiring of enzymes with minimal cytochromes

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Cytochromes are essential electron-transfer proteins that drive critical redox reactions in biological systems. In this presentation, I delve into the innovative application of minimal cytochromes—compact proteins with short peptide sequences—sourced from magnetotactic and electroactive bacteria. These streamlined cytochromes serve as highly efficient electron shuttles.

Inspired by nature's own designs, particularly the enzymes cellobiose dehydrogenase and pyranose dehydrogenase, we have engineered genetic fusions of these minimal cytochromes with various enzymes. This fusion significantly boosts enzymatic activity and enhances electron transfer to electrodes.

Throughout my talk, I will showcase a range of applications developed in our lab, where cytochromes are tethered to proteins and enzymes. These hybrid systems exhibit unique properties that advance biosensing, biocatalysis, and microbial electron transfer. By highlighting these developments, we aim to deepen our understanding of biological electron transfer strategies and unlock new possibilities in biotechnology.