CHEMISTRY & CHEMICAL BIOLOGY SEMINAR:

Turning the Reactivity Landscape of Metalloenzymes: From Active Site Modifications to Long-range Dynamic Effects

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Date:
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Time:
12:30 PM-2:00 PM

Link:
Please contact snsgradstaff@ucmerced.edu for the Zoom link and passcode.

Abstract:

Metalloenzymes rely on transition metals within the protein scaffold to perform a wide variety of molecular transformations in biology. Synthetic models of metalloenzyme intermediates, inspired by the enzyme active site and its secondary coordination sphere, have provided systems for studying bond-forming and bond-breaking events in well-controlled environments. However, recent evidence has suggested that the dynamic nature of proteins is intimately linked to enzyme function and activity, implying a reactivity landscape that is not only dependent on the ground state thermodynamics of the active site, but also on the long-range protein motions that orient the active site for optimum catalysis. The first part of this presentation will focus on the synthesis and reactivity of high-valent metal-oxo and metal-hydroxo corroles and corrolazines as models for reactive intermediates in Cytochrome P450. The role of electronic structure, peripheral ligand sterics, and Lewis acid effects on oxygen atom transfer and hydroxyl radical rebound reactivities were evaluated in the context of how the active site microenvironment tunes the reactivity of heme enzymes. The second part of the presentation will focus on our current efforts on characterizing activity-related protein motions in the non-heme enzyme soybean lipoxygenase (SLO-1). SLO-1 utilizes a well-defined hydrogen tunneling mechanism that is intrinsically dependent on the motions of the protein scaffold. Collectively, the findings from these research efforts have led to several fundamental insights regarding how reactivity is tuned from the active site and beyond, providing a possible blueprint for the design of efficient catalysts for biological and industrial applications.

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