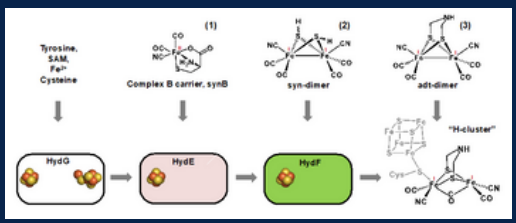
UC RIVERSIDE

BCH 252 Seminar Series

Dr. R. David Britt, Distinguished Professor, Department of Chemistry, UC Davis

Seminar Title: "Enzymatic Synthesis of the Organometallic H-Cluster of [FeFe] Hydrogenase"

Abstract: The [FeFe] hydrogenase enzymes are well suited to H_2 formation, producing up to 10000 H_2 molecules per second, and have therefore generated much interest for renewable energy applications. The H-cluster consists of a binuclear $[2Fe]_H$ subcluster which is linked via a bridging cysteine to a $[4Fe\text{-}4S]_H$ cluster. This $[2Fe]_H$ subcluster contains the organometallic elements of the H-cluster: the two irons each have a CO and a CN- terminal ligand and are bridged by a third CO and a unique SCH_2NHCH_2S azadithiolate (adt) moiety. The H+ and H_2 substrates are proposed to bind to and react at this $[2Fe]_H$ unit. In addition to the relative rarity of enzymes carrying out organometallic reactions, biosynthesis of the H-cluster poises some specific challenges. Of course, free CO and CN- molecules are toxic. In addition, the bridging adt moiety is known to be unstable in solution. The H-cluster biosynthesis is performed by a set of three "maturase" proteins, HydE, HydF, and HydG, each containing Fe-S clusters. Two of these, HydE and HydG, are members of the radical SAM superfamily of enzymes, while HydF is a GTPase. Our approach to developing a viable mechanistic proposal for H-cluster synthesis includes chemical biology techniques such as cell free synthesis, isotope sensitive spectroscopy such as electron paramagnetic resonance, and the use of synthetic clusters that can serve as functional substitutes for enzyme intermediates.



Tuesday, February 21st, 2023 | 12:00 p.m. - 12:50 p.m. PST

ZOOM Link: https://ucr.zoom.us/j/92569273073

Meeting ID: 925 6927 3073

Passcode: 689525

Hosts: Dr. Richard Debus & Dr. Russ Hille