
**Thursday, February 23, 2017, 12:30 pm**
**Seaver Science Library, Room 150**
*SSC Auditorium next to the library*

# Professor Michael Rose

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## Moving Hydrides with Iron and Electrons through Metal Oxides: Biomimetic and Solar Fuels Approaches for $H_2$ Utilization and Generation

### Abstract:

The use and generation of hydrogen as a renewable fuel and feedstock is gaining importance as the pressure to diminish our dependence on fossil fuels grows. Nature has developed elegant methods to activate and utilize hydrogen, especially for the purpose of carbon dioxide $CO_2$ fixation. One such enzyme, mono-[Fe] hydrogenase, uses a unique array of non-proteinaceous ligands to activate $H_2$ and perform hydride transfer to the $CO_2$-carrier substrate, $H_4$MPT+. The iron center is ligated by a unique organometallic pyridone-acyl cofactor, which along with two carbonyls and a Cys-S stabilizes a low-spin Fe(II) center. We have developed a novel anthracene-scaffold ligand the mimics the biological coordination sphere - in both the identity and crucial facial geometry of the CNS donor set. Studies of $H_2$ activation and hydride transfer will be discussed.

Second, a key component of solar energy storage is $H_2$ generation from solar fuels devices. Our work utilizes a combination of silicon photoelectrodes, molecular interfaces and metal oxide passivating layers to achieve stable photoelectrochemical performance. The molecular nature of the interface between the electrode and the passivating metal oxide is critical in controlling electron transfer and, ultimately, the efficiency of $H_2$ generation. We have used both molecular catalysts (PNP-Ni; Re-bpy) and Pt/Au nanoparticles for $H_2$ generation and $CO_2$ reduction. We are also investigating the use of embedded molecular wires in metal oxides ($Al2O_3$, $TiO_2$, ZnO) to enhance electron transport across these insulating oxide materials.

*Hosted by Professor Smaranda Marinescu*

The scientific community is invited

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