

September 26th, 2014

IMPACT Lectures



DR. JONAS PETERS

Bren Professor of Chemistry

**Division of Chemistry and
Chemical Engineering**

Caltech

Time: 1:00 PM

Location: 118 Newland Science Hall

“Fe-N₂ complexes for catalytic nitrogen fixation”

Prof. Peters' laboratory at Caltech is primarily focused on the design, synthesis, and characterization of inorganic species that have significantly pushed the boundaries of our understanding of electronic structure, bonding, and reactivity patterns. Out of this effort has grown the elucidation of a broad and unanticipated range of formal iron redox chemistry at pseudotetrahedral and 5-coordinate iron centers (from 0 to 4+) featuring nitrogenous ligands (L_nFe-N_x). This insight motivated the group to propose that a single iron site within the FeMo-nitrogenase might be capable of mediating overall N₂ reduction to NH₃. They have since developed examples of iron complexes that reduce N₂ catalytically at remarkably low temperatures (-78 °C) and atmospheric pressure. These are the first molecular iron catalysts that functionally model biological nitrogen fixation. They are also interested in other multi-electron reductive transformations broadly relevant to artificial photosynthesis schemes. For example, they have identified efficient molecular-cobalt-H₂-evolution electrocatalysts that operate at very low overpotentials. These electrocatalysts show promise towards the selective reduction of nitrite and CO₂ via incorporation of Lewis acidic Mg-cofactors. Lastly, they have contributed to the discovery and detailed mechanistic study of photo-induced, catalytic C-N cross-couplings in organic synthesis that operate at low temperatures (25 °C to -40 °C). Via a collaborative effort (with the Fu lab at Caltech) they have begun to extend the utility and scope of this process, which has relevance to the synthesis of nitrogen-containing heterocycles ubiquitous amongst drug candidates.

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Department of Chemistry and Biochemistry
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