University of Minnesota
Driven to Discover℠

Department of Chemistry

Seminar

9:45 a.m. Thursday, March 31, 2016 • 331 Smith Hall

Professor

Michael T. Green

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Exploring the factors that govern biological C-H bond activation

Research interests: mixture of theory and experiment to elucidate fundamental aspects of metalloprotein chemistry. We are particularly interested in understanding the factors that govern biological C-H bond activation. One system of interest is a class of proteins called cytochromes P450.

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Abstract

Nature's ability to suppress energetically favorable non-productive pathways is an enigmatic aspect of biological C-H bond activation—How does an enzyme oxidize one of the most inert chemical bonds without damaging itself in the process?—We examine this issue through the lens of P450 catalysis. Cytochrome P450s play critical roles in hormone synthesis and xenobiotic metabolism. Since the discovery of P450s over five decades ago, chemists have been enamored with their ability to selectively functionalize a wide range of organic compounds. A puzzling aspect of P450 chemistry is the enzyme's use of an electron-rich heme to catalyze the oxidation of inert hydrocarbons. Using rapid mixing and freezing techniques, we have prepared and characterized several intermediates in the P450 catalytic cycle. Through the application of a variety of spectroscopies, we have obtained insight into fundamental thermodynamic parameters as well as the electronic and geometric structures of these intermediates. Together these data suggest a mechanism by which nature can promote C-H bond activation, while minimizing non-productive oxidations of the protein superstructure.

Host: Professor William Tolman
Refreshments will be served prior to the seminar.