2020-2021 POCC Lecture Series

October 29, 2020, 7:30 PM

6:45 reception by Zoom (LINK)

Prof. Todd Hyster

Princeton University

Photoenzymatic Catalysis –

Using Light to Reveal New Enzyme Functions

Virtual Seminar by Zoom (LINK)

The Philadelphia Organic Chemist's Club

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Todd Hyster is a Minnesota native and did his undergraduate studies at the University of Minnesota. He conducted his Ph.D. studies with Tom Rovis at Colorado State University where he developed ligands for Rh-catalyzed C–H activation reactions. As part of his studies, he was a Marie Curie Fellow in the lab of Tom Ward at the University of Basel where he developed an artificial metalloenzyme to catalyze C–H activation reactions. After graduating in 2013, he was an NIH postdoctoral fellow in the labs for Frances Arnold at Caltech evolving P450s to catalyze nitrene transfer reactions. In 2015 he started his independent career at Princeton University where his group explores the ability of light to reveal previous unknown enzymatic functions.

Abstract: Enzymes are exquisite catalysts for chemical synthesis, capable of providing unparalleled levels of chemo-, regio-, diastereo- and enantioselectivity. Unfortunately, biocatalysts are often limited to the reactivity patterns found in nature. In this talk, I will share my groups efforts to use light to expand the reactivity profile of enzymes. In our studies, we have exploited the photoexcited state of common biological cofactors, such as NADH and FMN to facilitate electron transfer to substrates bound within enzyme active sites. In other studies, we found that enzymes will electronically activate bound substrates for electron transfer. In the presence of common photoredox catalysts, this activation can be used to direct radical formation to enzyme active sites. Using these approaches, we are able to develop biocatalysts to solve long-standing selectivity challenges in chemical synthesis.