

Department of Chemistry Seminar

Dr. Mary Andorfer

Massachusetts Institute of Technology



Thursday, January 13 at 3:30 PM (CT)

Virtual Event

Host: Prof. Andrew Buller

“Using Enzymes for Selective C–Cl and C–C Bond Forming Reactions”

Nature has evolved a range of enzymes capable of selective C–H functionalizations under mild reaction conditions. Many of these enzymes use molecular oxygen to drive reactivity, for example, flavin-dependent halogenases (FDHs) use NaCl and O₂ to generate a potent halogenating intermediate. Here we show that FDHs can be evolved to tune site-selectivity of halogenation, overriding substrate electronics and native site selectivity. Different C–H functionalization chemistry is available under anaerobic conditions, including reactions catalyzed by enzymes within the large glyoxyl radical enzyme (GRE) superfamily. Classes of GREs are able to form new C–C bonds between hydrocarbons that compose crude oil and alkenes through a hydroalkylation mechanism. Instead of relying on oxygen for their function, these enzymes can be damaged and inactivated under aerobic conditions. We have unraveled molecular details of a mechanism to repair oxygen-damaged GREs and are characterizing members of this family through single particle cryo-electron microscopy and in vitro biochemical assays.

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