Making, Seeing, and Using Subvalent Nitrogen Species

Direct C–H amination chemistry via electrophilic subvalent nitrogen intermediates could radically simplify access to nitrogen-containing small molecules by providing the chemical tools to selectively convert ubiquitous C–H bonds to valuable C–N bonds. At present, challenges in chemoselectivity, sustainability, and synthetic versatility prevent realization of the synthetic potential of C–H amination. This talk will describe recent efforts from the Powers Laboratory that advance 1) new strategies to structurally characterize transient intermediates in C–H functionalization reactions, 2) novel metal-free approaches to the sustainable generation of strong oxidants needed in C–H functionalization reactions, and 3) bifunctional reagent platforms that enable rapid elaboration of the primary products of C–H amination. Future directions and challenges will be discussed.

Dave was born in Allentown, PA and pursued undergraduate education at Franklin and Marshall College. He earned a Ph.D. from Harvard University with Prof. Tobias Ritter and pursued postdoctoral research at the Massachusetts Institute of Technology and Harvard University with Prof. Daniel Nocera. He joined the Texas A&M faculty in 2015 and was promoted to Associate Professor in 2021. His research program focuses on the chemistry of sustainably generated reactive intermediates in catalysis and has been recognized by an NSF CAREER award, a DOE Early Career Award, NIH MIRA, and a 2020 Sloan Fellowship. His efforts in the classroom have been recognized by Montague-Center for Teach Excellence and Association of Former Students College-Level Teaching Awards.