

Title: New Methods for C–N and C–C Bond Formation Based on Unique Reactivity in Iron Complexes

Abstract: First row transition metals present opportunities for the discovery of novel catalytic transformations based on their distinct reactivity. Iron complexes are especially attractive as transition metal catalysts given that iron is generally nontoxic and is the most abundant *d*-block metal in the Earth's crust. Research in the Neely focuses on the development of new C–N and C–C bond-forming methods based on behavior that is specific to iron. One area takes advantage of the regioselective [2+2] cycloaddition reaction of a ( $\beta$ -diketiminato)iron imide with an unsymmetrical internal alkyne to afford an iron azametallacyclobutene. This complex incorporates additional substrates including nitriles, aldehydes, and isonitriles with complete selectivity, establishing a foundation for the development of catalytic methods to synthesize valuable nitrogen-containing products. Other work focuses on the rare linear-selective alkyne trimerization reactivity of a pyridine bis(pyrrrolide)iron complex that generates 3,5-dien-1-yne products.