Abstract
The development of complexes that can facilitate the formation of C-O bonds is desirable as we seek homogeneous catalysts that are effective at upgrading natural gas reserves (primarily methane) to valuable products. The development of these catalysts requires a fundamental understanding of the mechanisms of C-O bond formation. In this presentation, we will discuss our efforts at oxyfunctionalization with oxorhenium complexes, and the development Cp*Ir^{III} complexes as catalysts for the functionalization of arenes and the stoichiometric functionalization of alkanes.