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"Universal Alkene Functionalization as an Aspirational Driver"

Abstract: Vicinal (1,2-disubstituted) functional group motifs are ubiquitous in structurally complex small molecules that are of academic and industrial importance, including many widely used pharmaceutical agents. Many such functional group combinations, however, remain exceptionally challenging to synthesize. The goal of research in the Engle lab is to develop a general catalytic platform for alkene and alkyne difunctionalization to introduce a diverse array of functional groups at each of the two carbon atoms in a programmable fashion. Our central hypothesis is that is that Lewis basic directing groups can be used to: (1) control the regioselectivity of Heck- and Wacker-type alkene addition, (2) rigidify the resultant alkylmetal intermediate to prevent β-H elimination, and (3) enhance selectivity for three-component coupling over competitive two-component coupling.

This concept has been used to expand the synthetic toolkit to include new retrosynthetic disconnections, including “homo-Michael” addition and β,γ-vicinal dicarbofunctionalization of alkenyl carbonyl compounds.

Biosketch: <https://englelab.com/about/>