ORGANIC SEMINAR

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Synthesis Through C–C Bond Scission

The topic of this talk is the radical chemistry based on C–C bond scission. The presentation will begin with another area of research endeavors in my group—*phosphorus organocatalysis*. It then will present how our need to create chiral phosphines, CarvoPhos, of particular configuration inspired our invention of a series of new reactions based on C–C bond cleavage. To be specific, we have implemented one-pot processes to ozonize alkenes into α-methoxyhydroperoxides, for subsequent Fe(II)-mediated reductive fragmentations that yield alkyl radical intermediates. Various radical trapping agents are capable of seizing the alkyl radical, enabling the conversion of the alkene $C(sp^3)$–$C(sp^2)$ bond to $C(sp^3)$–H, $C(sp^3)$–S, $C(sp^3)$–O, C=O, $C(sp^3)$–$C(sp^2)$, $C(sp^3)$–C(sp), $C(sp^3)$–halogen bonds, the last two of which were facilitated by catalytic Fe(II) with vitamin C as the stoichiometric reductant. More recently implemented is a pathway for the Cu(I)-catalyzed dealkenylative amination for the late-stage modification of hormones, pharmaceutical reagents, peptides, and nucleosides. Beyond alkenes, generalized methods for converting the $C(sp^3)$–$C(sp^2)$ bonds of ketones to $C(sp^3)$–X linkages (X = H/C/heteroatom) will also be presented.

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