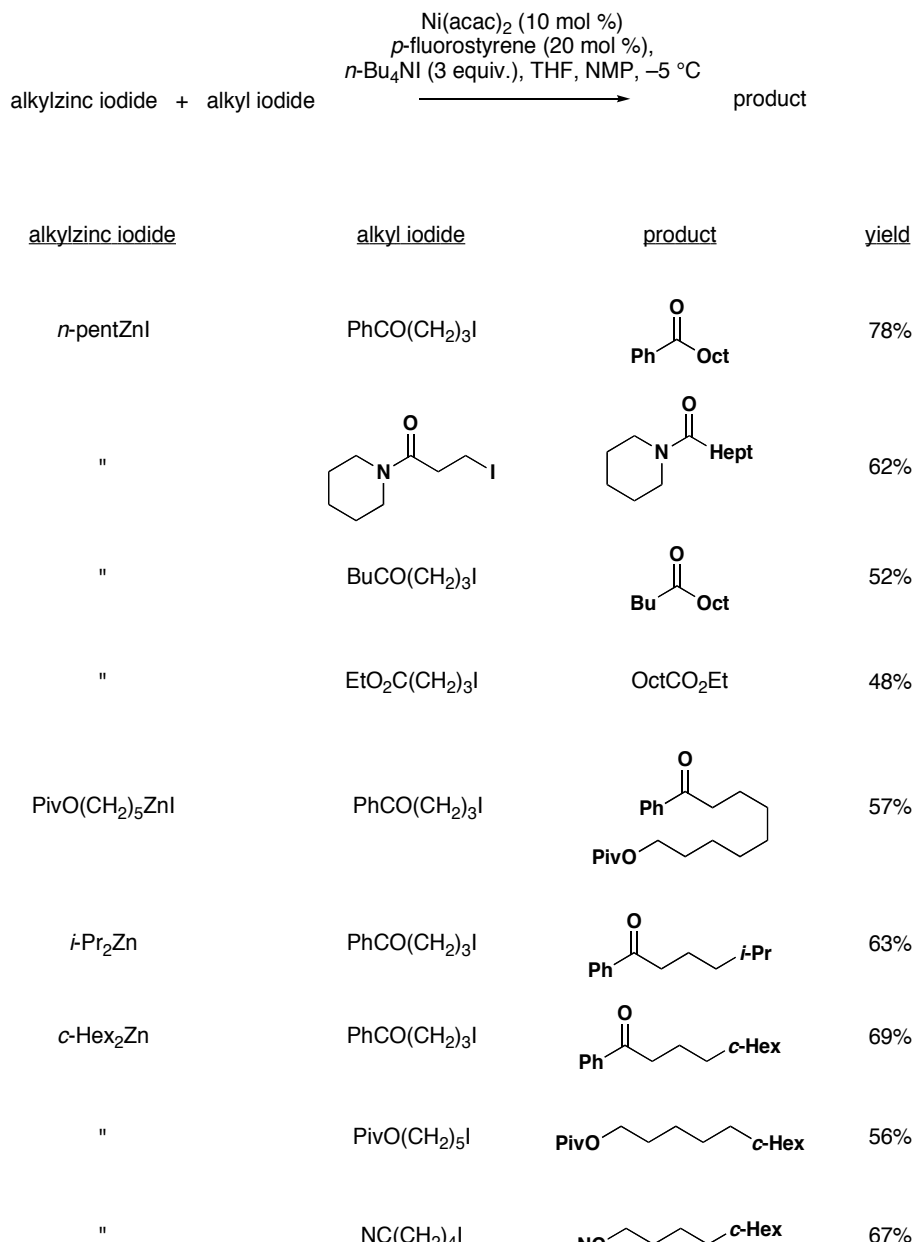
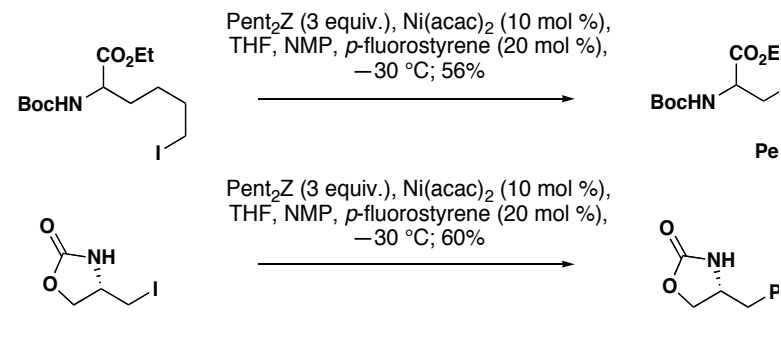


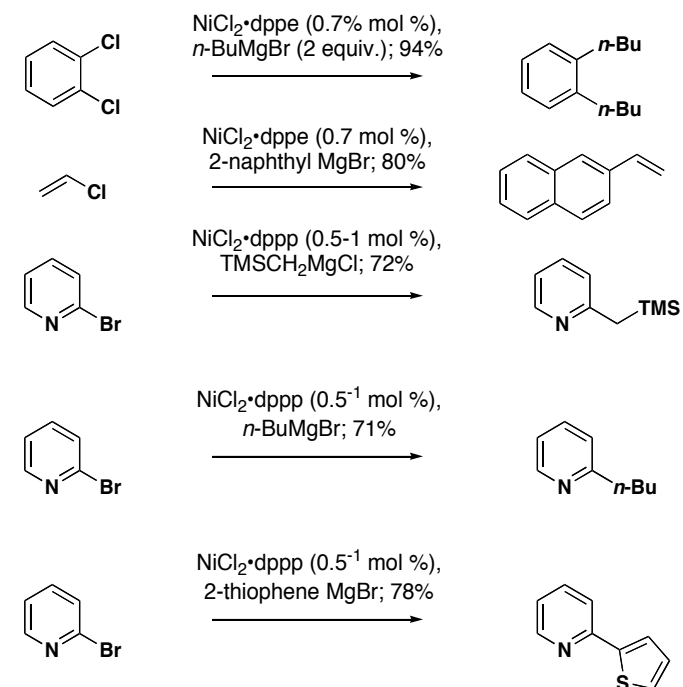
Methodology for the nickel(0)-catalyzed homologation of alkyl halides using organozinc reagents (Knochel, *JOC*, **2002**, 79.):

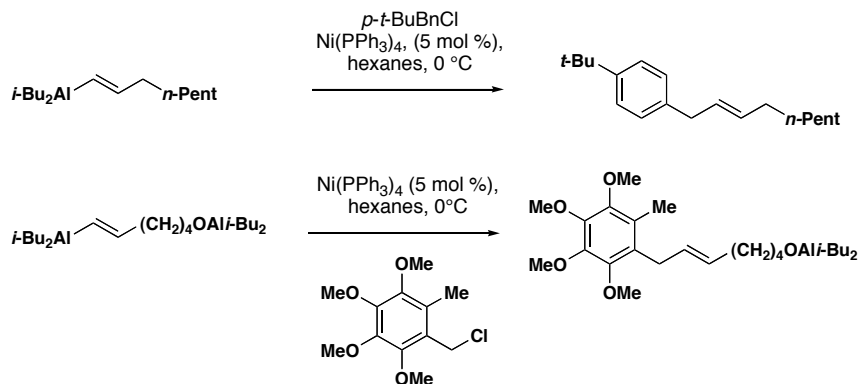
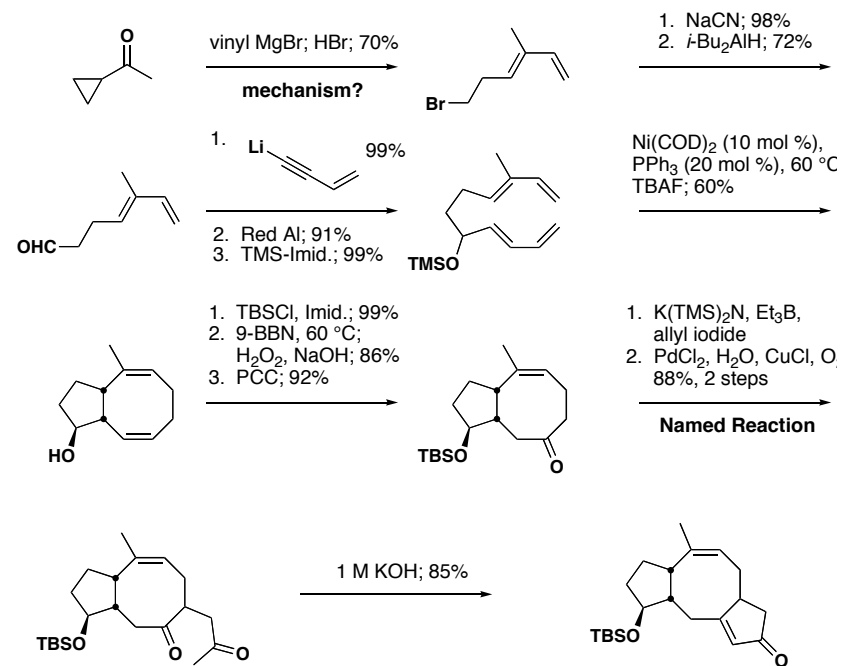
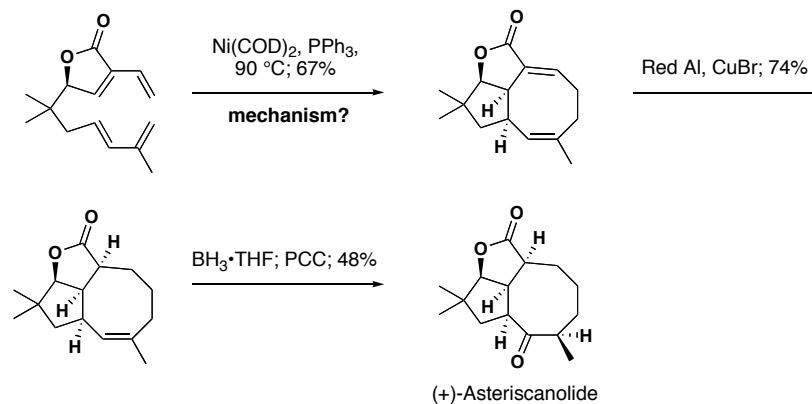
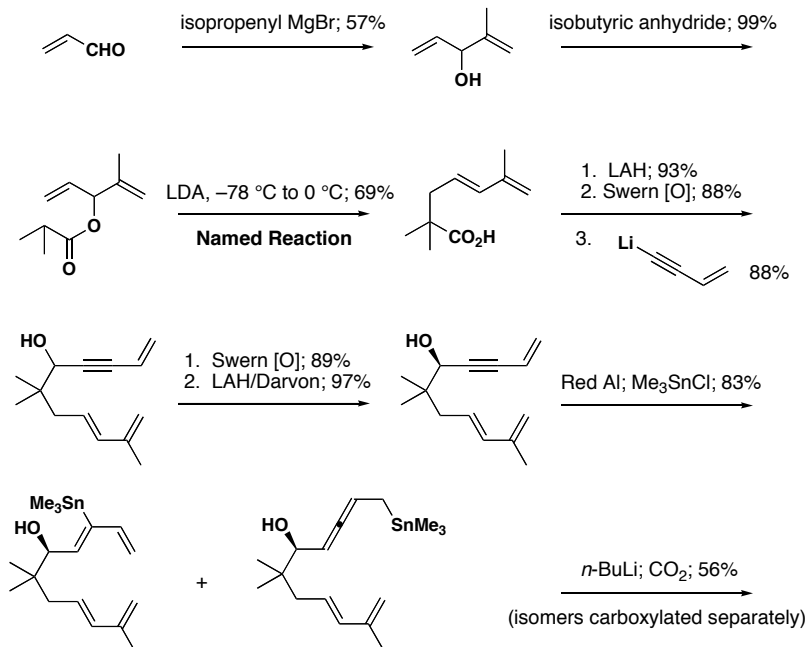


Compatibility with Bronsted acidic functionality:

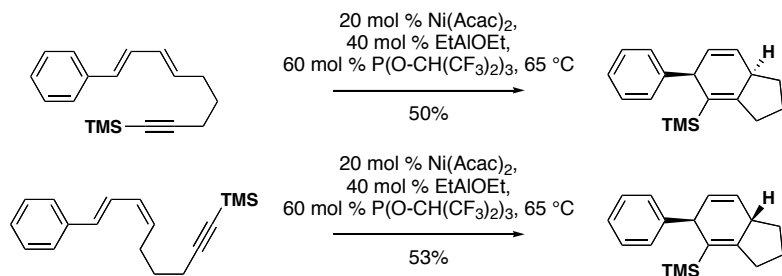


Kumada coupling (Nickel(0)-catalyzed Csp^2 to $\text{Csp}^2/\text{Csp}^3$ centers; Kumada, *Bull. Chem. Jpn.*, **1976**, 1958. Kumada, *Tetrahedron*, **1982**, 3347. Kumada, *Tetrahedron Lett.*, **19** Kumada, *Pure & Appl. Chem.*, **1980**, 669. Kumada, *J. Am. Chem. Soc.*, **1972**, 4374.):

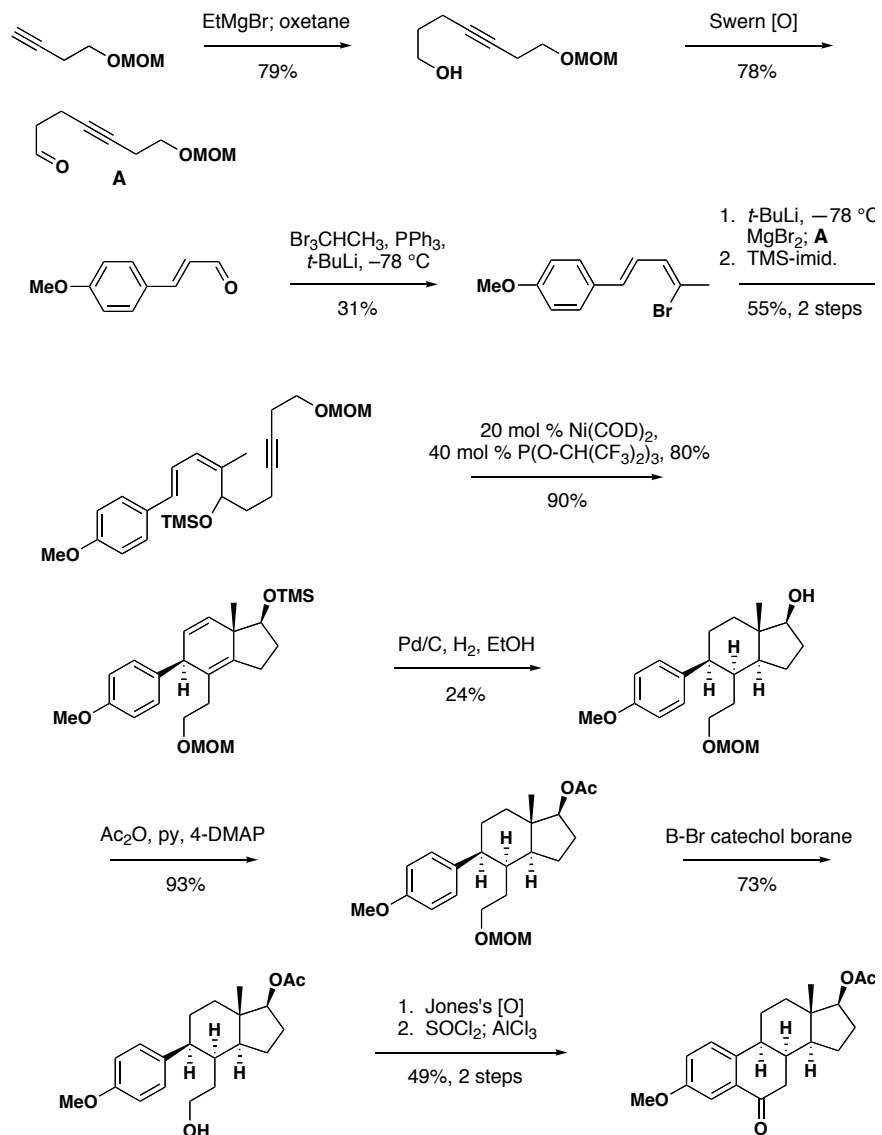


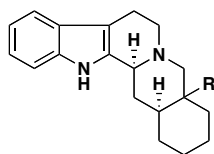
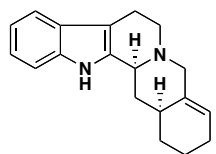
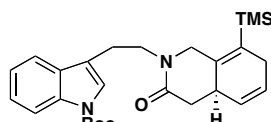
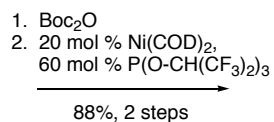
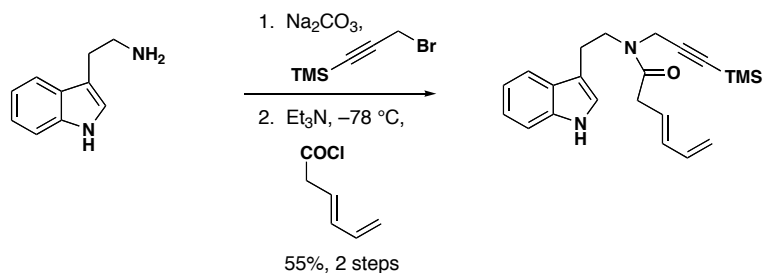
Kumada–Negishi coupling (Lipshutz, *Tetrahedron*, **1996**, 7265.):Nickel(0)-catalyzed 4 + 4 cycloadditions and applications to the total syntheses of (+)-Asteriscanolide and Dicyclopenta[a,d]cyclooctene 5–8–5 Ring Systems (Wender, *J. Am. Chem. Soc.*, **1988**, 5904. Wender, *J. Am. Chem. Soc.*, **1997**, 4908.)

Nickel(0)-catalyzed 4 + 2 cycloadditions: room temperature Diels-Alder reactions that produce 1,4-cyclohexadienes (Wender, *J. Org. Chem.*, **1995**, 2962. Wender, *J. Org. Chem.*, **1996**, 824.)

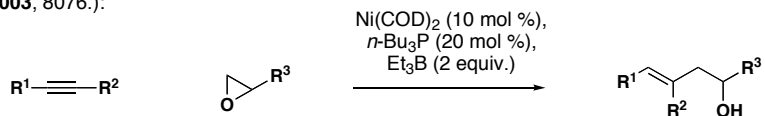


Mechanism:

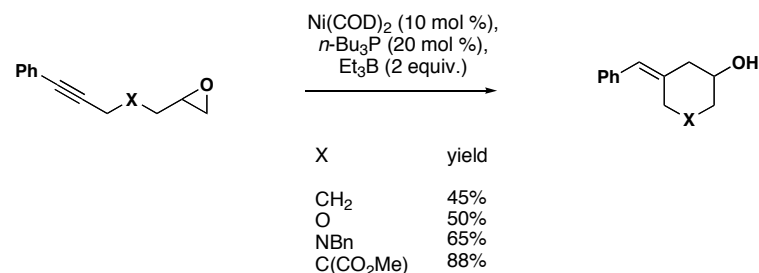




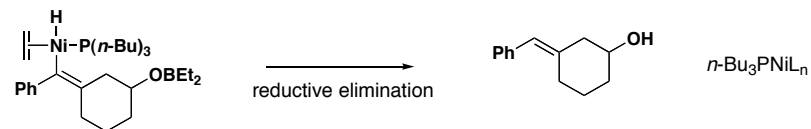
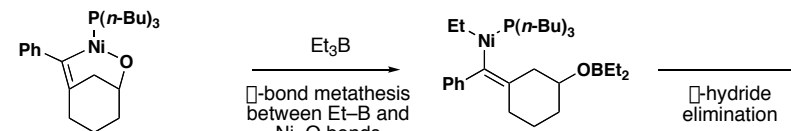
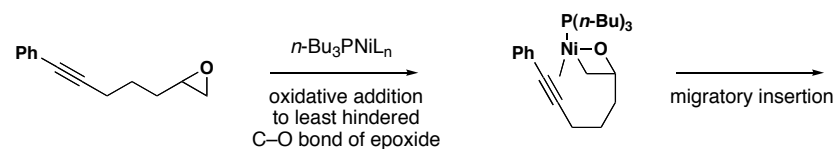
Nickel(0)-catalyzed reductive coupling of Alkynes and Epoxides (Jamison, *J. Am. Chem. Soc.*, 2003, 8076.):

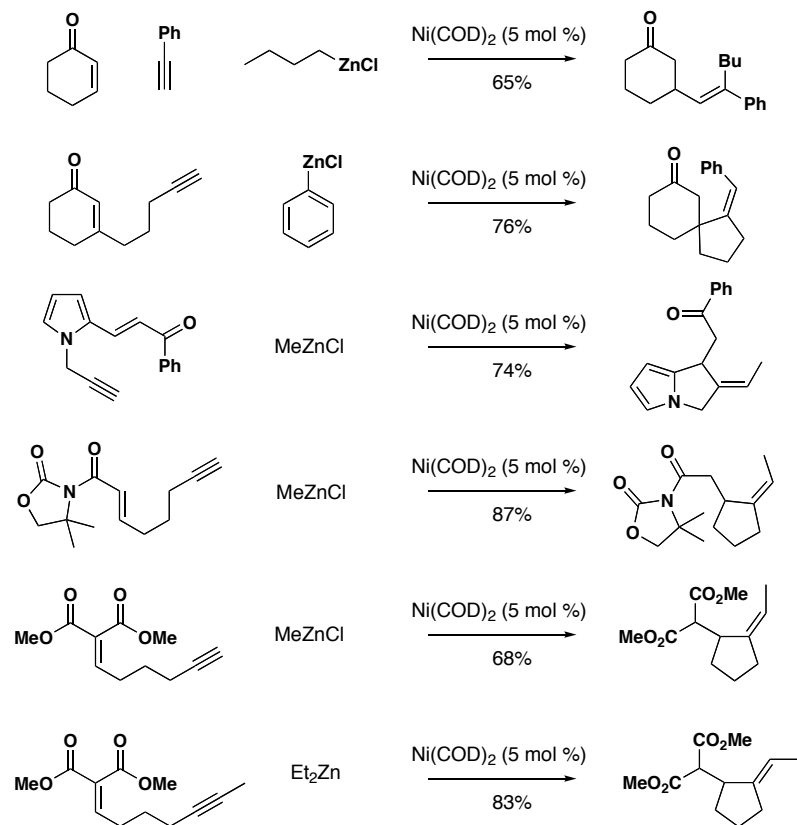


R1	R2	R3	yield
Ph	Me	Me	71%
Ph	Me	<i>n</i> -Hex	68%
Ph	Me	Ph	50%
<i>n</i> -Pr	<i>n</i> -Pr	Et	35%

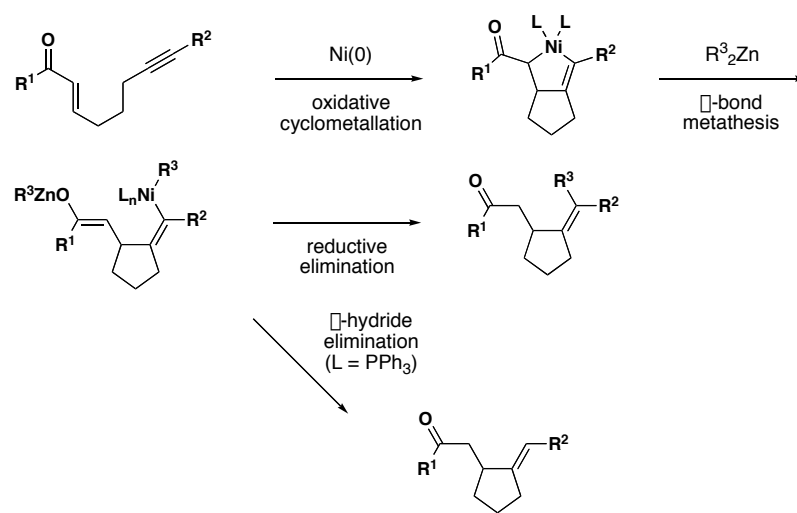
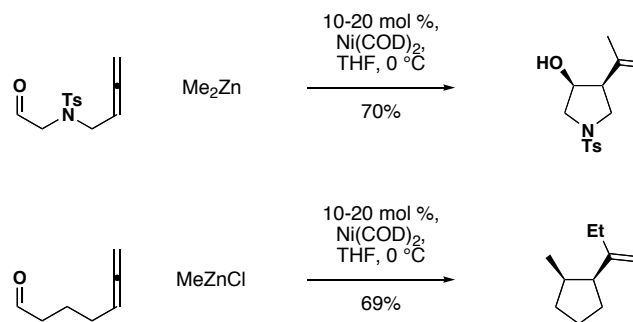


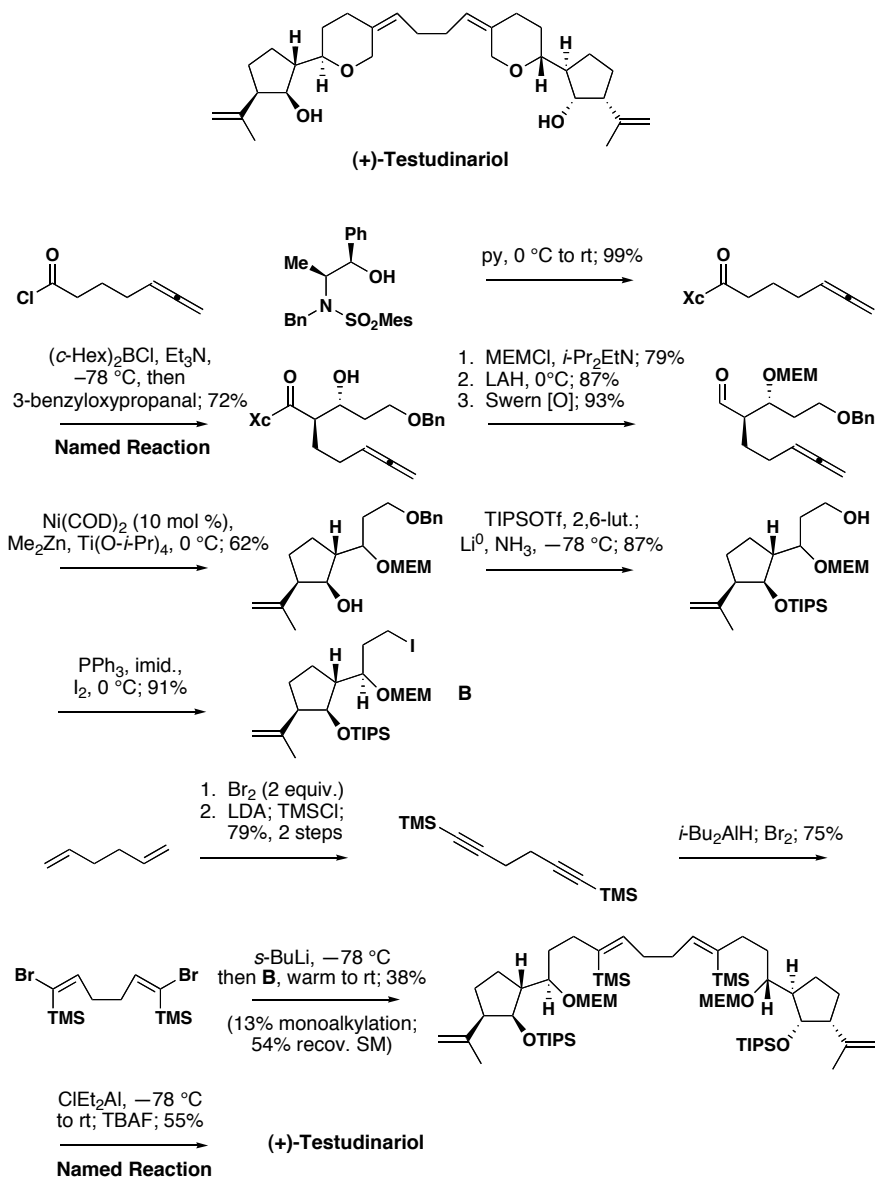
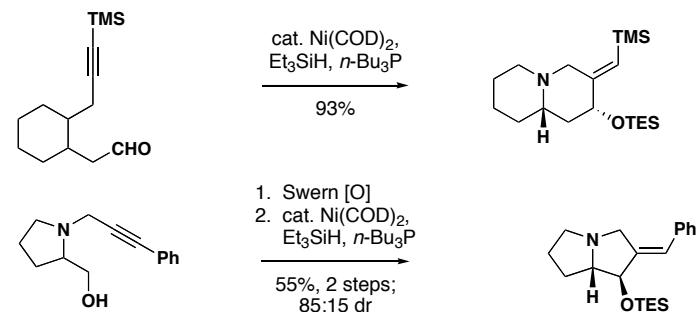
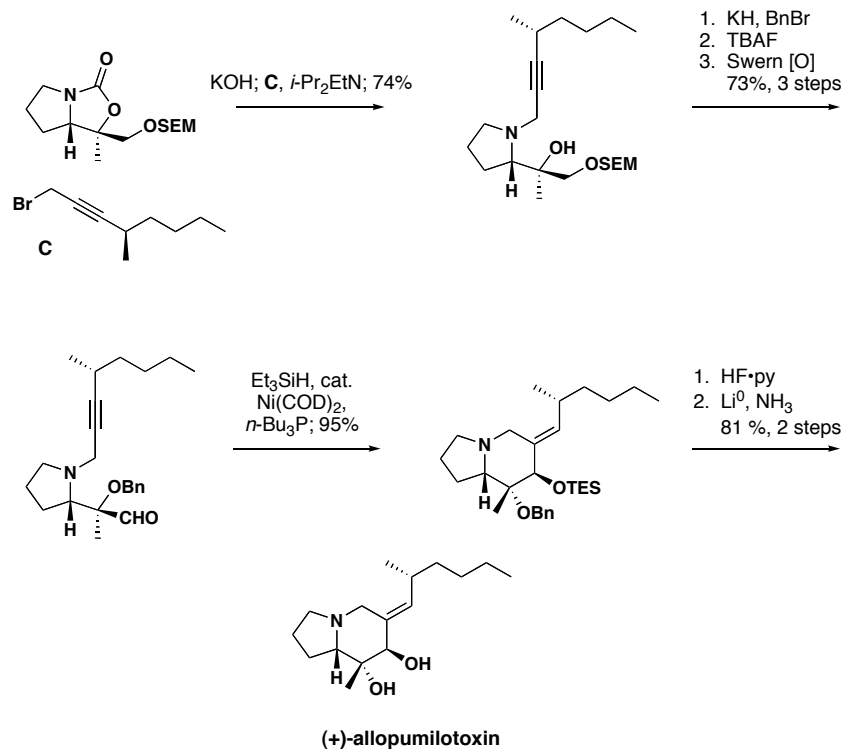
Proposed Mechanism:

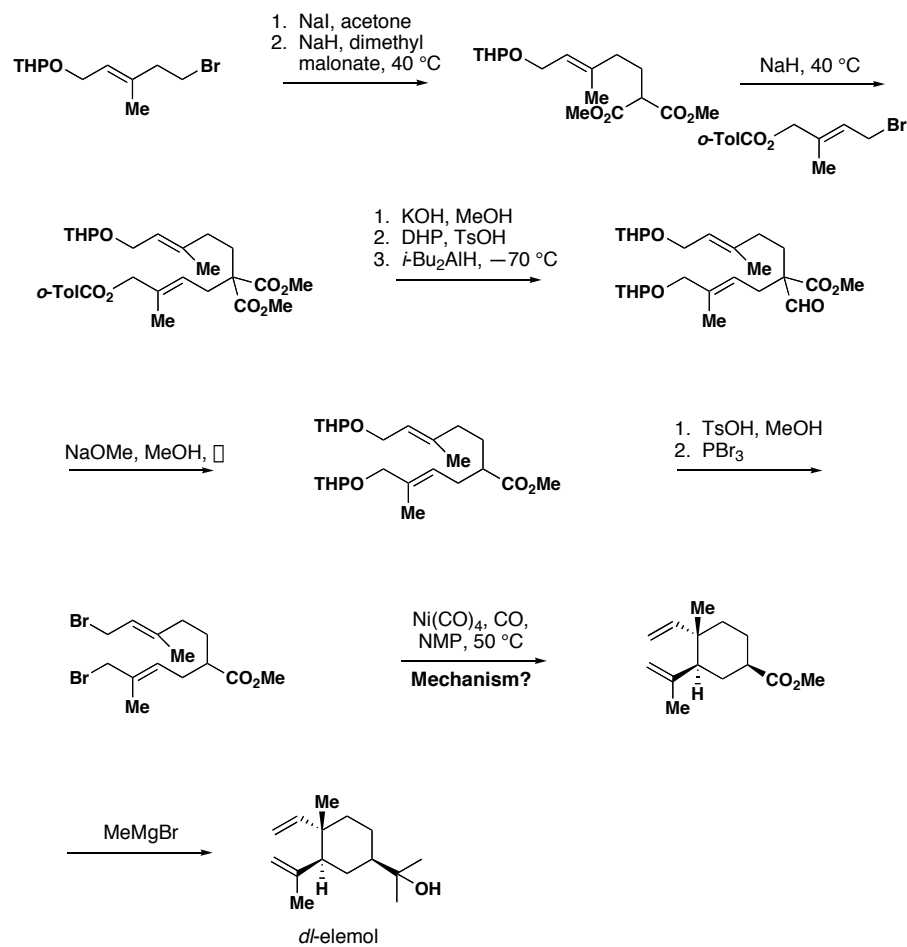


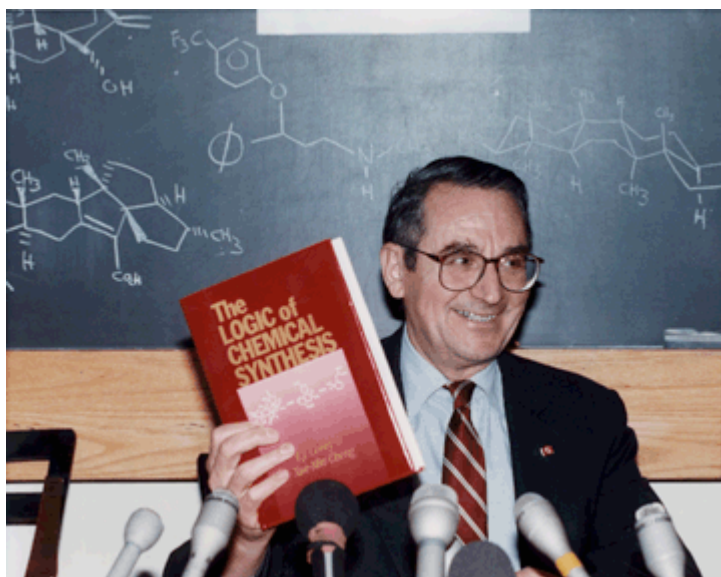
Coupling of an enone, alkyne, and organozinc (Montgomery, *Acc. Chem. Res.*, **2000**, 467.):

Proposed Mechanism:

Coupling of an aldehyde, allene, and organozinc (Montgomery, *Acc. Chem. Res.*, **2000**, 467. Montgomery, *Org. Lett.*, **2002**, 4009.)

Enantioselective total synthesis of (+)-Testudinariol (Montgomery, *J. Am. Chem. Soc.*, **2002**, 9366.):Coupling of an aldehyde, alkyne, and silane (Montgomery, *Acc. Chem. Res.*, **2000**, 467.):Total synthesis of (+)-allopumilotoxin 267A (Montgomery, *J. Am. Chem. Soc.*, **2000**, 6950.):

Total Synthesis of *d*-Elemol (Corey, *TL*, 1969, 1779; *JACS*, 1967, 2758.):



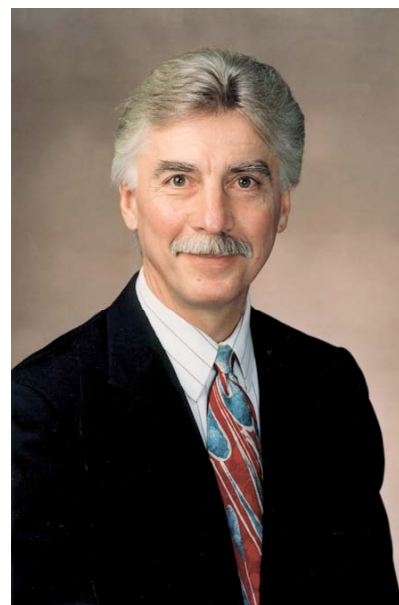
E. J. Corey, Harvard



John A. Montgomery,
Wayne State University, MI



Timothy F. Jamison, MIT



Paul A. Wender, Stanford