Total Synthesis of (−)-Merochlorin A

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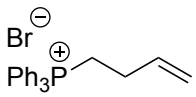
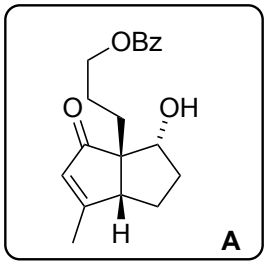
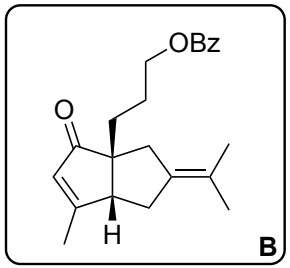


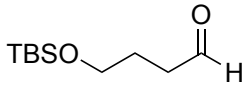
1–7



8–11

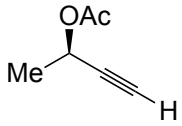


X =



1) LiBr (2.0 eq), PhLi (1.0 eq) *then* **X** *then* PhLi (1.1 eq) *then* 1,2-diiodoethane
2) **Y**, $PdCl_2(PPh_3)_2$, CuI, NEt_3
3) 9-BBN *then* $NaBO_3$•4 H_2O
4) BzCl, pyridine
5) TBAF
6) $(COCl)_2$, DMSO *then* NEt_3
7) Au(MeCN)(JohnPhos)SbF_6, H_2O (cat.)

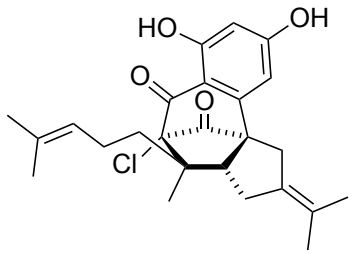
Y =



8) Tf_2O, 2,6-lutidine *then* DBU
9) $PdCl_2$, CuCl, O_2, DMF/H_2O
10) $LaCl_3$•2 LiCl (5.0 eq), **Z**
11) BF_3•OEt_2 (1.5 eq), Et_3SiH (excess)

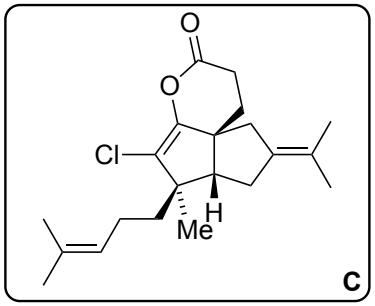
Z =

Step 1: Please provide the name of the reaction.
Hint: Think about the intermediates and what effect additional PhLi has to arrive at the correct product.
Wittig reaction – Schlosser modification. Process is a SCOOPY (α-Substitution plus Carbonyl Olefination via β-Oxido Phosphorus Ylides. Mechanism: see below
Step 7 – Key step: Please provide a reasonable mechanism that accounts for the formation of **A**. **Hint:** Several named reactions take place in this cascade.
See below



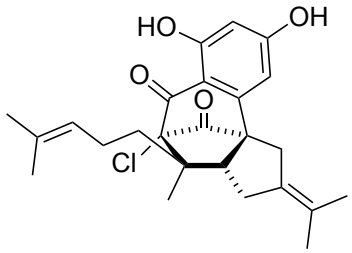
(−)-merochlorin A

12–16



C

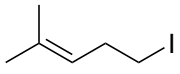
17–22



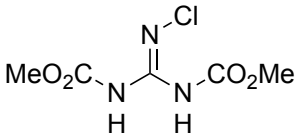
(−)-merochlorin A

12) **W**, *t*-BuLi *then* LiCu(CN)(2-thiofurenyl) *then* **B**, $BF_3{\bullet}OEt_2$
13) NEt_3, TMSOTf *then* **CBMG**
14) K_2CO_3, MeOH/THF
15) PDC, DMF
16) Ac_2O (neat), NaOAc, 140 °C

W =

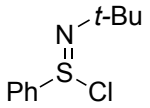


CBMG =

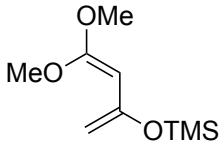


17) DIBAL-H (1.3 eq), PhMe
18) PCC, celite
19) LDA, *then* **U**
20) **V**, 110 °C *then* 1 M HCl
21) NEt_3, TMSOTf, *then* $Pd(OAc)_2$ (1.5 eq)
22) LiCl, 135 °C

U =



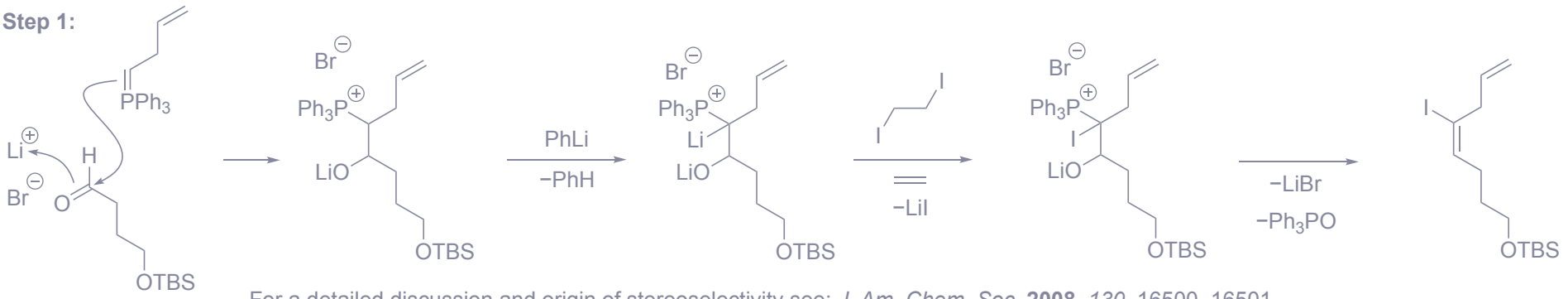
V =



Step 17: The product formed can be seen as the product of a formal [1,3]-rearrangement. Please explain formation of the product.

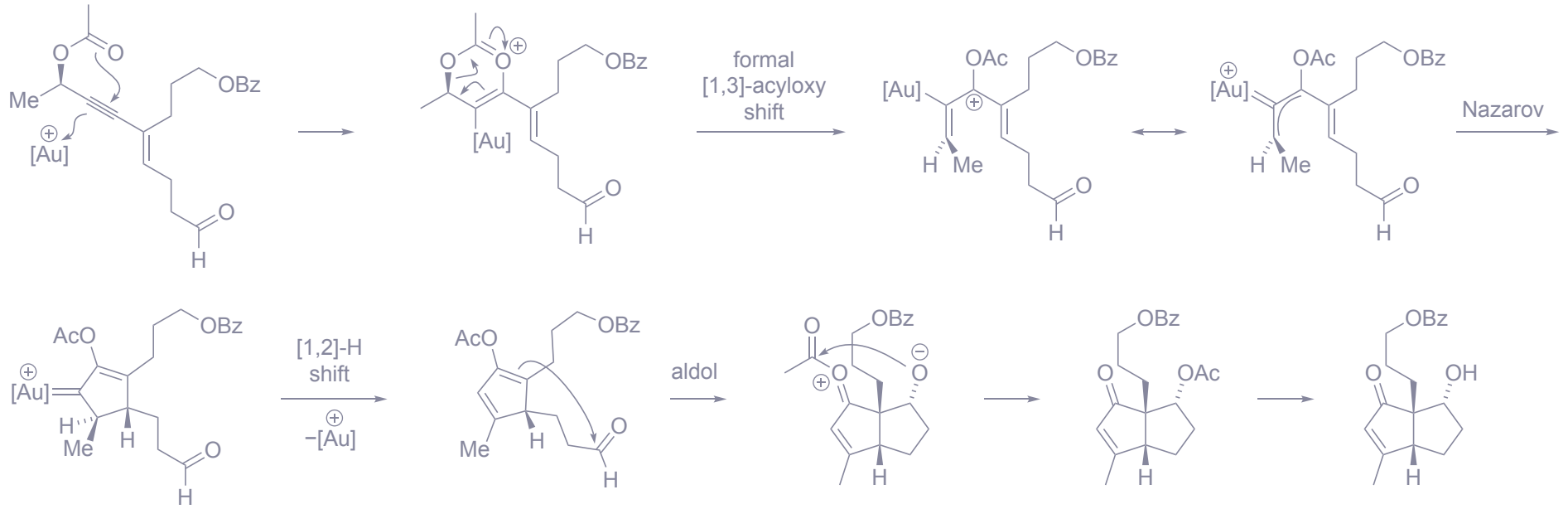
See below

Step 1:



For a detailed discussion and origin of stereoselectivity see: *J. Am. Chem. Soc.* **2008**, *130*, 16500–16501.

Step 7:



Also possible via hydrolyis of acetate and then aldol; see: *Chem. Sci.* **2019**, *10*, 8219–8223.

Step 17: